EMC® Host Connectivity with QLogic Fibre Channel and iSCSI Host Bus Adapters (HBAs) and Converged Network Adapters (CNAs) for the Linux Environment

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Contents

As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this document may not be supported by all revisions of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.

If a product does not function properly or does not function as described in this document, please contact your EMC representative.

This guide describes the features and setup procedures for Linux hosts with QLogic host bus adapters (HBAs) and converged network adapters (CNAs) to EMC Symmetrix and CLARiiON Storage Array systems.

Audience   This guide is intended for use by storage administrators, system programmers, or operators who are involved in acquiring, managing, or operating Symmetrix, CLARiiON, and host devices.

Readers of this guide are expected to be familiar with the following topics:

◆ Symmetrix or CLARiiON system operation

◆ Linux operating environment

◆ QLogic adapters and drivers

EMC Support Matrix   For the most up-to-date information, always consult the *EMC Support Matrix* (ESM), available through E-Lab Interoperability Navigator (ELN) at: http://elabnavigator.EMC.com, under the **PDFs and Guides** tab.

Related documentation

The following related documents are available on Powerlink:

- ◆ *EMC Host Connectivity Guide for Linux*
- ◆ *EMC Linux iSCSI Attach Release Notes*
- ◆ *EMC Networked Storage Topology Guide*
- ◆ For information on Navisphere, refer to the Navisphere Management software documentation in the Documentation Library on EMC Powerlink at http://Powerlink.EMC.com.

Conventions used in this document

EMC uses the following conventions for special notices.

Note: A note presents information that is important, but not hazard-related.

⚠ **IMPORTANT**

An important notice contains information essential to operation of the software.

⚠ **CAUTION**

A caution contains information essential to avoid data loss or damage to the system or equipment.

Typographical conventions

EMC uses the following type style conventions in this document:

Normal	Used in running (nonprocedural) text for:
	• Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus)
	• Names of resources, attributes, pools, Boolean expressions, buttons, DQL statements, keywords, clauses, environment variables, filenames, functions, utilities
	• URLs, pathnames, filenames, directory names, computer names, links, groups, service keys, file systems, notifications
Bold	Used in running (nonprocedural) text for:
	• Names of commands, daemons, options, programs, processes, services, applications, utilities, kernels, notifications, system call, man pages
	Used in procedures for:
	• Names of interface elements (such as names of windows, dialog boxes, buttons, fields, and menus)
	• What user specifically selects, clicks, presses, or types

Italic:	Used in all text (including procedures) for:
	• Full titles of publications referenced in text
	• Emphasis (for example a new term)
	• Variables
Courier	Used for:
	• System output, such as an error message or script
	• URLs, complete paths, filenames, prompts, and syntax when shown outside of running text
Courier bold	Used for:
	• Specific user input (such as commands)
Courier italic	Used in procedures for:
	• Variables on command line
	• User input variables
< >	Angle brackets enclose parameter or variable values supplied by the user
[ ]	Square brackets enclose optional values
|	Vertical bar indicates alternate selections - the bar means "or"
{ }	Braces indicate content that you must specify (that is, x or y or z)
...	Ellipses indicate nonessential information omitted from the example

Where to get help EMC support, product, and licensing information can be obtained as follows.

Product information — For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink website (registration required) at:

http://Powerlink.EMC.com

Technical support — For technical support, go to EMC Customer Service on Powerlink. To open a service request through Powerlink, you must have a valid support agreement. Please contact your EMC sales representative for details about obtaining a valid support agreement or to answer any questions about your account.

Your comments Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send your opinion of this document to:

techpub_comments@EMC.com

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Introduction

This document describes the procedures for installing an EMC-approved QLogic host bus adapter (HBA) or converged network adapter (CNA) into a Linux host environment and configuring the host for connection to an EMC storage array over Fibre Channel or Fibre Channel over Ethernet (FCoE).

Purpose of this document

This document is meant to assist in the installation and configuration of QLogic host bus adapters (HBAs) and Fibre Channel Over Ethernet (FCoE) converged network adapters (CNAs) in Linux environments. The focus of this document is to enable the integrated Qlogic driver in the Linux distributions for Fibre Channel adapters, and to set up Linux hosts using the EMC-supported driver for Qlogic FCoE adapters, available from the EMC-approved section of the QLogic website.

Host connectivity

Review the *EMC Support Matrix* or contact your EMC representative for the latest information on qualified adapters, drivers, and Linux distributions.

Note: EMC does not support mixing different types of Fibre Channel adapter (including different types from the same vendor) in a server.

Fibre Channel

The Fibre Channel adapter driver functions as a device driver layer below the standard Linux SCSI adapter driver. The Fibre Channel interface therefore is transparent to the Linux disk administration system.

Fibre Channel over Ethernet

EMC now supports the QLogic Fibre Channel over Ethernet (FCoE) Converged Network Adapter (CNA). FCoE adapters provide a method to converge both Fibre Channel and Ethernet traffic over a single physical link to a switch infrastructure which manages both storage (SAN) and network (IP) connectivity within a single unit.

The benefits of FCoE technology become apparent in large data centers:

◆ Where dense, rack-mounted and blade server chassis exist.

◆ Where physical cable topology simplification is a priority.

◆ In virtualization environments, where several physical storage and network links are commonly required.

The installation of the QLogic FCoE CNA provides the host with an Intel-based 10 gigabit Ethernet interface (using the existing in-box drivers), and an QLogic Fibre Channel adapter interface, which requires the installation of the supported driver revision.

Following installation of the proper driver for the FCoE CNA, the Fibre Channel interface will function identically to that of a standard QLogic Fibre Channel HBA, as the FCoE simply encapsulates Fibre Channel traffic within ethernet frames. As such, FC-based content within this document also applies directly to the QLogic FCoE CNAs.

In-depth information about FCoE and its supported features and topologies can be found in the "Fibre Channel over Ethernet (FCoE)" chapter of the *EMC Networked Storage Topology Guide,* available through E-Lab Interoperability Navigator at: http://elabnavigator.EMC.com.

Boot device support

Linux hosts using QLogic adapters have been qualified for booting from EMC storage array devices interfaced through Fibre Channel as specified in the *EMC Support Matrix*.

The Symmetrix® or CLARiiON® device that is to contain the Master Boot Record (MBR) for the host must have a lower logical unit number (LUN) than any other device visible to the host. This device must be mapped as /dev/sda by the Linux operating system for the boot to succeed from the device.

Refer to Chapter 7, "Configuring a Boot Device on an EMC Storage Array," for further information on booting from the SAN.

Zoning

When using Linux hosts in a fabric environment, the zoning must be set up as single initiator and single target zoning. A single initiator/single target zone is composed of one adapter and one EMC storage array port. Storage array ports can be shared among adapters; however, each adapter must be in its own zone.

Note: Multi-initiator zones are not recommended in a Linux fabric environment.

EMC storage array-specific settings

Refer to the *EMC Host Connectivity Guide for Linux*, available at http://Powerlink.EMC.com, for EMC storage array-specific settings.

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Installation Steps

This chapter outlines the prerequisisites for first-time installation, offers a summary of the installation steps with links to the appropriate sections, and provides information on installing the adapter.

Review the *EMC Support Matrix* for the latest information on approved adapters and drivers.

Prerequisites for first-time installation

In order to complete a first-time installation of the QLogic adpater in your server, you will need the following:

Operating system

Before the adapter is installed, the Linux operating system must be installed and properly configured. Install the Linux kernel from the distribution installation CD by following the procedure provided in the distribution installation guide. Partition the boot drive, and select the packages and services necessary for the host.

⚠ **IMPORTANT**

Include the kernel source/development package and the gcc compiler tools during the installation. If these tools are not installed, then the out-of-kernel driver installation may fail and the driver will not be installed.

QLogic SANSurfer and SANSurfer CLI

QLogic's SANsurfer program is a GUI-based utility and the SANsurfer CLI is a text-based utility. Both applications may be installed on any Linux system and used to manage, configure, and update the EMC-approved QLogic adapters.

Complete documentation and the EMC-qualified versions of SANsurfer and the SANsurfer CLI are available for download from the EMC-approved section of the QLogic website.

http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/Oem_EMC.aspx

Follow the links to your adapters for the appropriate version.

BIOS and firmware

The version of BIOS and firmware (adapter firmware for your iSCSI HBA, and CEE/Menlo firmware for your CNA) per the *EMC Support Matrix* for your supported configuration.

These are available for download from the EMC-approved section of the QLogic website.

http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/Oem_EMC.aspx

Follow the links to your adapters for the appropriate version.

Linux driver   The Linux driver for your HBA or CNA per the *EMC Support Matrix* for your supported configuration.

EMC supports both in-kernel and out-of-kernel drivers.

Note: The installation of the in-kernel driver occurs when you install your Linux distribution of choice.

Refer to the latest *EMC Support Matrix* for your specific Linux distribution, kernel version, and driver to determine whether or not you need to proceed with the following out-of-kernel instructions.

If your installation requires an out-of-kernel driver, download it from the EMC-approved section of the QLogic website.

`http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/Oem_EMC.aspx`

Follow the links to your adapters for the appropriate version.

Summary of installation steps

Table 1 describes the procedures for installing an EMC-approved QLogic adapters into a Linux host and configuring the host for connection to an EMC Storage Array over Fibre Channel (FC) or Fibre Channel over Ethernet (FCoE).

Table 1   Installation steps (page 1 of 2)

Step	Instructions	For Fibre Channel, refer to	For Fibre Channel over Ethernet (FCoE), refer to
1	Install the adapter .	"Installing the adapter" on page 20	"Installing the adapter" on page 20
2	Verify the BIOS version	"Verifying the correct BIOS version" on page 28	"Verifying the correct BIOS version" on page 28
3	Install the BIOS. There are three states:		
	• If no version is installed	"Upgrading the adapter BIOS" on page 29	"Upgrading the adapter BIOS" on page 29
	• If wrong version is installed	"Upgrading the adapter BIOS" on page 29	"Upgrading the adapter BIOS" on page 29
	• If correct version is installed	Proceed to step 4.	Proceed to step 4.
4	Install the driver. There are two states:		
	• In kernel	For drivers listed in the *EMC Support Matrix* as in kernel drivers, there is no need to install a driver since the process of installing the operating system has already included the driver. Table 4 on page 39 lists supported QLogic driver versions . If in kernel, proceed to Step 5.	For drivers listed in the *EMC Support Matrix* as in kernel drivers, there is no need to install a driver since the process of installing the operating system has already included the driver. Table 4 on page 39 lists supported QLogic driver versions . If in kernel, proceed to Step 5.
	• Out of kernel	"Installation instructions for the out of kernel QLogic driver" on page 50	"Method 2: Installing the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic installation script" on page 54.

Table 1   Installation steps (page 2 of 2)

Step	Instructions	For Fibre Channel, refer to	For Fibre Channel over Ethernet (FCoE), refer to
5	Install the firmware. There are two states:		
	• Wrong firmware	The adapter firmware is part of the Linux driver and cannot be altered.. Proceed to Step 6.	The adapter firmware is part of the Linux driver and cannot be altered. "Updating the QLogic CEE /Menlo firmware for FCoE adapters" on page 82 Once corrected, proceed to Step 6.
	• Correct firmware	Proceed to Step 6.	Proceed to Step 6.
6	Connect to the storage.	"Zoning and connection planning in a fabric environment" on page 84	"Zoning and connection planning in a fabric environment" on page 84
7	Reconfigure the device.	"Device reconfiguration procedures" on page 105	"Device reconfiguration procedures" on page 105

Installing the adapter

Follow the instructions included with your adapter. The adapter installs into a single slot.

To connect the cable to the adapter:

1. (Optical cable only) Remove the protective covers on each fiber-optic cable.

2. Plug one end of the cable into the connector on the adapter as shown in the appropriate figure in this step. (The hardware might be rotated 90 degrees clockwise from the orientation shown.)

   • Fibre Channel adapter connectivity options include copper cable with DB9 connector, SC optical, and LC optical cable, as shown next.

     – Copper cable with DB9 connector:
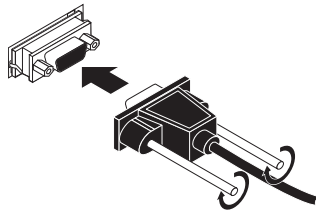
     – SC optical cable:
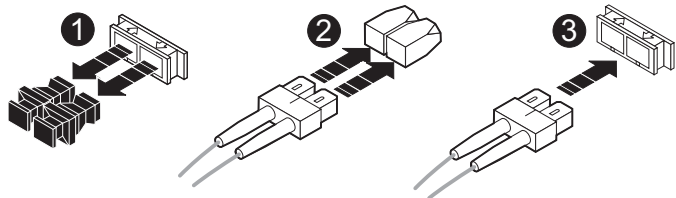
     – LC optical cable:
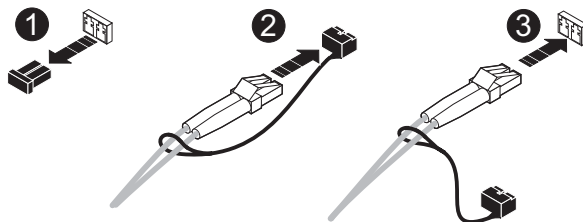
- Fibre Channel over Ethernet converged network adapter (CNA) connectivity options include LC optical and Cisco SFP+, shown next.

  – LC optical cable:
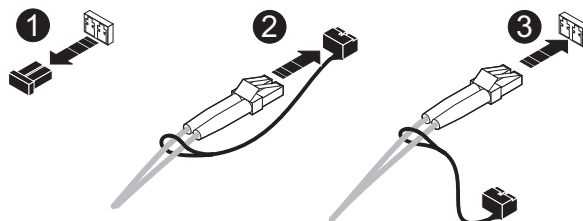
  – Cisco SFP+ (Twinax cable)

3. Plug the other end of the cable into a connector on the storage system or a hub/switch port.

4. Label each cable to identify the adapter and the storage/switch/hub port to which it connects.

5. After connecting all adapters in the server, power up the server.

Matching the adapter with the correct PCI slot

When choosing an adapter for your server, it is important to know which adapter is compatible with your server's PCI/PCI-X/PCI Express slots. Certain adapter models have specific voltage requirements or physical limitations that allow them to work only in specific slots.

Servers have several different bus slot types for accepting adapters:

◆ PCI
◆ PCI-X
◆ PCI-X 2.0
◆ PCI-Express

PCI slots can be 32-bit and 64-bit (denoted by their 124-pin or 188-pin connectors.) These slots have plastic "keys" that prevent certain adapters from fitting into them. These keys work with the cutout notches in the adapter edge connector so that only compatible adapters will fit into them. This is done because of the voltage characteristics of the adapter. Inserting a 3.3v adapter into a 5v slot would cause severe damage to both the adapter and the server. Therefore, the slot keys denote the type of voltage provided by the slot and effectively prevent a voltage incompatible adapter from being inserted.

Figure 1 shows how PCI slots will appear with their keys and what type of voltage is provided for each slot type.
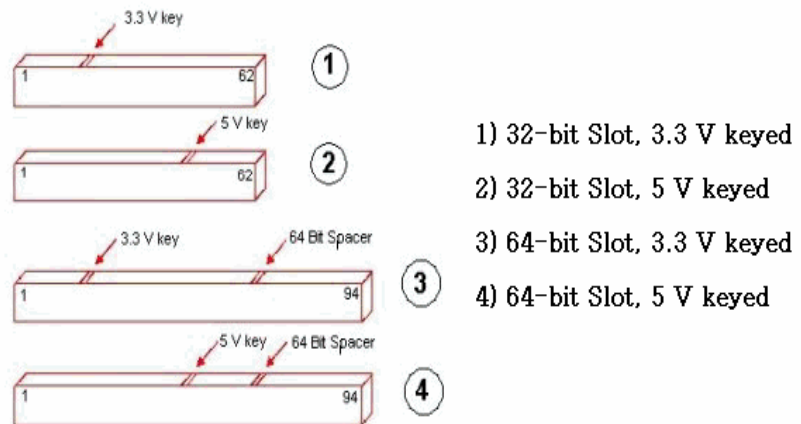
Figure 1   PCI slot types and voltage key locations

Figure 2 shows the adapter edge connectors compatible with the PCI slots shown in Figure 1 on page 22. Note adapter 5, which shows a universal adapter edge connector. Universal adapters are compatible with both 3.3 V and 5 V PCI slots.

1) 32-bit connector, 3.3 V keyed

2) 32-bit connector, 5 V keyed

3) 64-bit connector, 3.3 V keyed

4) 64-bit connector, 5 V keyed

5) 64-bit universal connector (3.3V, 5V)
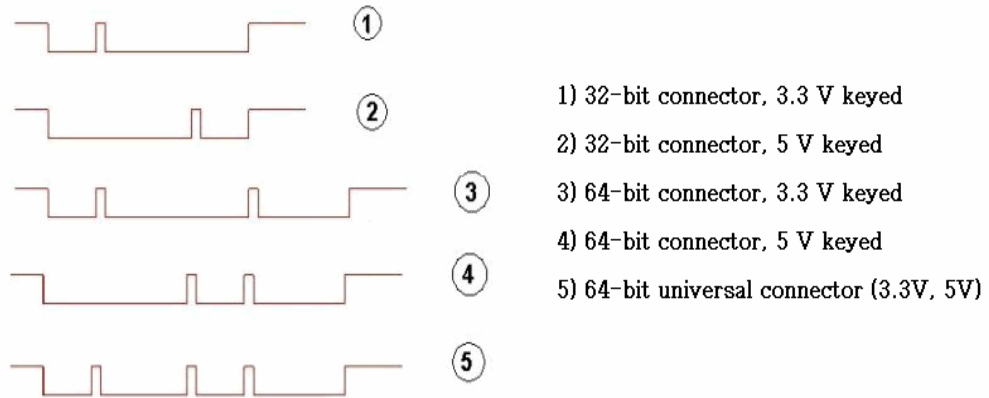
Figure 2   Adapter edge connectors

PCI-X (or PCI Extended) slots increase the speed with which data travels over the bus. PCI-X slots appear identical to a 64-bit PCI slot keyed for 3.3 V. (Refer to number 3 in Figure 1 on page 22 and Figure 2.) PCI-X slots are backwards compatible with 3.3 V PCI adapters and universal adapters. Inserting standard PCI adapters into PCI-X slots will lower the bus speed as they cannot take advantage of the improved performance.

PCI-X 2.0 is the next generation of PCI-X buses. PCI-X 2.0 increases the bus speed again, providing more performance for adapters. PCI-X 2.0 slots also appear identical to a 64-bit PCI slot keyed for 3.3 V. (Refer to number 3 in Figure 1 and Figure 2.) PCI-X 2.0 is also fully backward compatible with 3.3 V PCI and PCI-X.

PCI Express (sometimes noted as PCIe) is a new bus type that uses the existing PCI model, but implements it in a faster, serial protocol. Because of the serial way it transmits data, the PCI Express bus slot can be different sizes depending on the throughput it supports. PCI Express slot speeds are expressed in "lanes" and are normally shown as x1, x4, x8, and x16. Each type of slot is a different length (as shown in Figure 3 on page 24) and adapter edge connectors will also be of varying lengths depending on how many lanes they require for

throughput. Because of how PCI Express slots are keyed, an x1 adapter can be inserted in all four slot types, as the adapter will negotiate with the slot to determine the highest mutually supported number of lanes. However, an adapter requiring x16 lanes will not fit into a smaller slot.
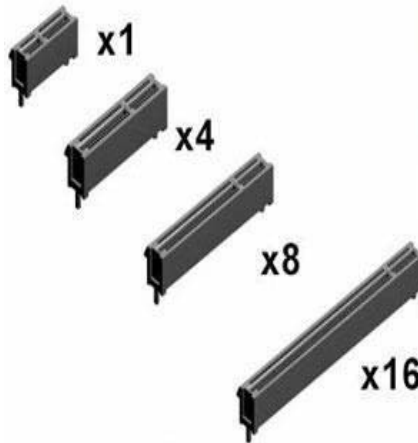
Figure 3   PCI Express slots

Figure 4 shows x1, x4, and x16 lane slots aligned on a mainboard. You can see how the slots are keyed so that low-lane adapters can fit into larger slots.
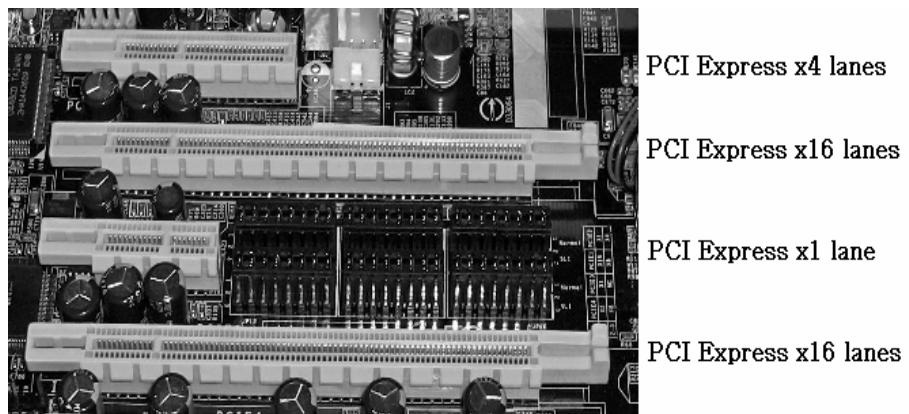
Figure 4   PCI Express slots aligned

QLogic offers adapters for each bus/slot type available. Table 2 shows each of the EMC-supported QLogic adapters, and their respective slot requirements. Be sure to consult both your server user guide and QLogic to ensure that the adapter you want to use is compatible with your server's bus.

Table 2   Slot requirements of EMC-supported QLogic adapters

Adapter model	Protocol	PCI spec	BUS length	Power	Slot key
QLA2200F	FC	PCI 2.1	64-bit	3.3V, 5V	Universal
QLA200	FC	PCI-X 1.0a & PCI 2.2	32-bit	3.3V, 5V	3.3V
QLA210	FC	PCI-X 1.0a & PCI 2.2	32-bit	3.3V	3.3V
QLA2310F	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V, 5V	Universal
QLA2340LF	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V, 5V	Universal
QLA2342LF	FC	PCI-X 1.0a & PCI 2.2	64-bit	3.3V, 5V	Universal
QLE2360	FC	PCI Express	x4 lane	3.3V	n/a
QLE2362	FC	PCI Express	x4 lane	3.3V	n/a
QLA2460	FC	PCI-X 2.0a & PCI 2.3	64-bit	3.3V	3.3V
QLA2462	FC	PCI-X 2.0a & PCI 2.3	64-bit	3.3V	3.3V
QLE2460	FC	PCI Express	x4 lane	3.3V	n/a
QLE2462	FC	PCI Express	x4 lane	3.3V	n/a
QLE220	FC	PCI Express	x4 lane	3.3V	n/a
QLE2560	FC	PCI Express	x4 lane	3.3V	n/a
QLE2562	FC	PCI Express	x4 lane	3.3V	n/a
QLE8042	FCoE	PCI Express	x8 lane	3.3V	n/a

Remember that some of the older adapters are tall (also referred to as full-height) and may not fit into a server with a low-profile chassis. These factors must be considered before implementing your configuration to avoid unnecessary delays and possible equipment swaps or returns.

Currently, the QLogic FCoE converged network adapters (CNAs) require servers that can accommodate full-height, full-length PCI Express adapters. Always refer to the *EMC Support Matrix* for the most up-to-date information on which servers support these adapters.

3

Installing and Configuring the BIOS Settings

This chapter describes the procedures for installing and configuring the BIOS settings.

Verifying and configuring the BIOS settings

After the adapter is installed, follow these steps during system boot to verify and configure adapter firmware settings.

To use SANsurfer or SANsurfer CLI for this function refer to the SANsurfer or SANsurfer CLI documentation you have downloaded.

Refer to the *EMC Support Matrix* for required BIOS versions for qualified adapters.

Verifying the correct BIOS version

You can determine the BIOS version at boot time from the QLogic banner or from the **Fast!Util Options** menu.

◆ From the banner — Boot the host and watch for the banner (shown in the QLA2340 example below, with the ROM BIOS version highlighted):

```
Qlogic Corporation
QLA2312 PCI Fibre Channel ROM BIOS Version 1.42
Copyright © Qlogic Corporation 1993-2002 All rights reserved
Press <CTRL - Q> for Fast!UTIL
www.qlogic.com
```

  • If the banner displays the required version, continue to the section "EMC recommended adapter BIOS settings" on page 31.

  • If the banner does not display the required version, upgrade the firmware as described under the "Upgrading the adapter BIOS" on page 29; then proceed to "EMC recommended adapter BIOS settings" on page 31.

◆ From the QLogic **Fast!Util Options** menu:

  a. Boot the host. When the QLogic banner appears, press **CTRL-Q** to enter Fast!Util.

  b. Select **Configuration Settings** from the **Fast!Util Options** menu.

  c. Select **Adapter Settings** from the **Configuration Settings** menu.

d. Under **Adapter Settings**, note the BIOS version:

   – If the banner displays the required version, continue to "EMC recommended adapter BIOS settings" on page 31.

   – If the banner does not display the required version, upgrade the firmware as described under the "Upgrading the adapter BIOS" on page 29; then proceed to "EMC recommended adapter BIOS settings" on page 31.

Upgrading the adapter BIOS

The BIOS may be upgraded using one of the following three methods:

◆ "Method One: Upgrading the adapter BIOS using the NVRAM file on a DOS bootable floppy" on page 29

◆ "Method 2: Upgrading the adapter BIOS using QLogic SANsurfer" on page 30

◆ "Method 3: Upgrading the adapter BIOS using QLogic SANsurfer CLI" on page 30

Method One: Upgrading the adapter BIOS using the NVRAM file on a DOS bootable floppy

Follow these steps to upgrade the QLogic BIOS using the NVRAM file on a DOS bootable floppy:

1. Obtain the latest version of the BIOS from the QLogic website:

   a. Access http://www.qlogic.com.

   b. Click **Downloads** at the left side of the screen.

   c. Click the **EMC** link below **OEM Models**.

   d. Find the NVRAM file for the adapter(s) in your system, and click the associated **Download** link to save the file.

2. The file is a self-extracting .zip containing the BIOS and NVRAM files. Make sure flasutil.exe and the source files (BIN, DEF, DAT, and BAT files) are in the same directory. EMC-specific settings are contained in files named emcXXXX.def and emcXXXX.dat where XXXX is the model number of the adapter.

   These settings files (also referred to as NVRAM setting files) should also be in the same directory with the flash utility and source files. Note that some versions of BIOS may use different filenames depending on the version and adapter model.

Be sure to check the readme included with the BIOS files to make sure you have all of the appropriate files before proceeding.

a. Insert a diskette into a Microsoft Windows 9x machine.

b. Open any DOS window.

c. At the DOS prompt, format the diskette by entering:

format /s a:

d. At the DOS prompt, change directory (**cd**) to the location of the saved zipped file, then extract the file to the diskette.

Note: The QLogic adapter(s) must be installed in the host before proceeding.

3. Insert the BIOS upgrade installation diskette into the floppy drive.

4. Reboot the host.

5. After the host has rebooted, a DOS prompt appears. Type **flasutil /L /F** and press **Enter**.

Note: The adapter BIOS upgrade might take a few minutes.

6. After the upgrade is complete, remove the diskette and reboot the host. During startup, the QLogic banner should display the new BIOS version.

Method 2: Upgrading the adapter BIOS using QLogic SANsurfer

The SANsurfer GUI may be downloaded from the EMC-approved section of the QLogic website. To update the BIOS using the SANsurfer CLI, refer to the QLogic provided documentation on their website for detailed instructions.

To invoke the GUI, run the following command from a terminal window:

/opt/QLogic_Corporation/SANsurfer/SANsurfer &

When upgrading the BIOS for QLogic 4 GB adapters, the minimum required version of the QLogic SANsurfer GUI is 2.0.30b52.

Method 3: Upgrading the adapter BIOS using QLogic SANsurfer CLI

The SANsurfer CLI (scli) is installed as part of the qlinstaller or may be downloaded from the EMC-approved section of the QLogic

website. To update the BIOS using the SANsurfer CLI, refer to the QLogic provided documentation on their website for detailed instructions.

To invoke the CLI, run the following command:

`/opt/QLogic_Corporation/SANsurferCLI/scli`

When upgrading the BIOS for QLogic 4 GB adapters, the minimum required version of the QLogic SANsurfer CLI is 1.06.16build23.

EMC recommended adapter BIOS settings

EMC requires configuring the QLogic BIOS settings with the EMC-approved NVRAM settings file. This file contains all of the BIOS settings for the QLogic adapters that have been tested and approved for connection to EMC storage arrays.

Refer to the *EMC Support Matrix* for required NVRAM versions for qualified adapters.

EMC recommended NVRAM settings for Linux

Table 3 lists the NVRAM parameters and their values. The QLogic default values are those that ship with a standard adapter that was not included in an EMC package. The EMC-recommended settings depend upon whether failover functionality is used. The settings listed under the **No Failover Functionality** heading are those that have been pre-configured in the EMC-approved NVRAM file. The settings listed under the **With PowerPath® or VEERITAS DMP** heading are those that have been tested and determined to be applicable in a Linux environment.

The settings are configurable in NVRAM using the **Host Adapter Settings**, **Advanced Settings**, and **Extended Firmware Settings** menus. To use SANsurfer or the SANsurfer CLI to modify the

NVRAM settings, refer to the SANsurfer or SANsurfer CLI documentation from QLogic.

Table 3   QLogic BIOS settings (page 1 of 2)

		EMC recommended settings	
	QLogic default	No Multipath functionality	With Multipath functionality
Host Adapter settings			
Host Adapter BIOS	Disabled	• Disabled (No boot from SAN) • Enabled (Boot from SAN)	• Disabled (No boot from SAN) • Enabled (Boot from SAN)
Frame Size	2048	2048	2048
Loop Reset Delay	5	5	5
Adapter Hard Loop IP	Disabled	Disabled	Disabled
Hard Loop ID	0	125	125
Spin-up Delay	Disabled	Disabled	Disabled
Connection Options (topology)	2	• 1 (FC Fabric environment) • 0 (FC DAS/Loop environment)	• 1 (FC Fabric environment) • 0 (FC DAS/Loop environment)
Fibre Channel Tape Support	Enabled	Disabled	Disabled
Data Rate	2	1 2 4 8 **Note:** Match port data rate on real environment.	1 2 4 8 **Note:** Match port data rate on real environment.
Advanced Adapter settings			
Execution Throttle	16	256	256
LUNs per Target	8	256	256
Enable LIP Reset	No	No	No
Enable LIP Full Login	Yes	Yes	Yes
Enable Target Reset	Yes	Yes	Yes
Login Retry Count	8	8	8
Port Down Retry Count	8	45	30

Table 3   QLogic BIOS settings (page 2 of 2)

		EMC recommended settings	
	QLogic default	No Multipath functionality	With Multipath functionality
Link Down Timeout	15	45	15
Extended Error Logging	Disabled	• Disabled (Do not use debugging) • Enable (Use debugging)	• Disabled (Do not use debugging) • Enable (Use debugging)
Operation Mode	0	0	0
Interrupt Delay Timer	0	0	0
Selectable Boot settings			
Selectable Boot	Disabled	Disabled	Disabled
(Primary) Boot Port Name, LUN	WWNN*	WWNN*	WWNN*
Boot Port Name, LUN	0	0	0
Boot Port Name, LUN	0	0	0
Boot Port Name, LUN	0	0	0

* The WWNN of the server's boot LUN must be listed in this field.

Note: The QLogic driver may override the EMC-recommended NVRAM values. Unless otherwise specified, use the default implemented by the driver.

The values for the **Connection Options** parameter are as follows:

◆   0 for Loop Only

◆   1 for Point-to-Point

◆   2 for Loop preferred, otherwise Point-to-Point

Note: For Linux attach, EMC recommends setting the Connection Options parameter to 1 when attached to a fabric and to 0 when attached to an EMC storage array directly.

Manually setting the topology for QLogic adapters

The EMC default setting for the topology is set to 2 (Loop preferred; otherwise, point to point).

For Linux environments, it is recommended that the Connection Options parameter be set to 1 when attached to a fabric and to 0 when attached to an EMC storage array directly.

Follow these steps to set the NVRAM variables for the topology:

1. Boot the host. When the QLogic banner appears, press **Ctrl-Q** to enter the **Fast!Util** menu.

2. Select **Configuration Settings** from the **Fast!Util Options** menu.

3. Select **Host Adapter Settings** from the **Configuration Settings** menu.

4. Select **Connection Options** (topology) and press **Enter**.

5. Select the appropriate topology and press **Enter**:

    • FC-AL - **0** (loop only)

    • FC-SW - **1** (point to point only)

6. Press ESC to return to the **Fast!Util Options** menu.

7. When prompted to save the changes made to the current adapter, select **Save Changes**.

8. If you have more adapters to configure, choose **Select Host Adapter** and repeat steps 2 through 7 for each adapter.

9. Press **ESC** to exit the **Fast!Util** menu.

10. Reboot the host.

Manually setting the data rate for QLogic adapters

The EMC default setting for the data rate on the QLA23xx/QLE23xx adapters is Auto Select mode. If necessary, the mode may be set manually to 1 GB, 2 GB, or Auto Select mode.

The EMC default setting for the data rate on the QLA24xx/QLE24xx 4 GB capable adapters is Auto Select mode. If necessary, the mode may be set manually to 1 GB, 2 GB, 4 GB, or Auto Select mode.

To use SANsurfer or the SANsurfer CLI to modify the NVRAM settings, refer to the SANsurfer or SANsurfer CLI documentation from QLogic.

Note: For any device connected to the adapter, set the device data rate (if applicable) before setting the adapter data rate.

Follow these steps for each QLogic adapter to be modified:

1. Boot the host. When the QLogic banner appears, press **Ctrl**-**Q** to enter the **Fast!Util** menu.

2. Select **Configuration Settings** from the **Fast!Util Options** menu.

3. Select **Host Adapter Settings** from the **Configuration Settings** menu.

4. Select the **Data Rate** setting and press **Enter**.

5. Select the appropriate speed for the device to which the QLA23xx adapter will connect. The options are 0 for 1 GB/s, 1 for 2 GB/s, and 2 for Auto Select.

6. Press **ESC** to return to the **Fast!Util Options** menu.

7. When prompted to save the changes made to the current adapter, select **Save Changes**.

8. Repeat steps 2 through 7 for each adapter.

9. Press **ESC** to exit the **Fast!Util** menu.

10. Reboot the host.

4

Installing and Configuring the Linux Host with the QLogic Driver

This chapter describes the procedures for installing and configuring the driver.

Introduction

Using the QLogic adapter with the Linux operating system requires adapter driver software. The driver functions at a layer below the Linux SCSI driver to present Fibre Channel devices to the operating system as if they were standard SCSI devices.

EMC supports the QLogic in kernel default drivers in the distribution in most later operating systems. See Table 5 on page 49 for a list of QLogic out of kernel driver versions supported with corresponding OS updates. (These driver versions require manually installation.)

Refer to the latest *EMC Support Matrix* for specific qualified kernel versions and distributions.

Note: The support stated in the *EMC Support Matrix* supersedes versions listed in this document.

Supported in kernel driver versions

Note: QLogic CNAs are not supported within kernel drivers. Refer to the "Installation instructions for the out of kernel QLogic driver" on page 50 for more information.

Table 4 lists some examples of supported operating systems in kernel driver versions.

Table 4   Supported in kernel driver versions   (page 1 of 2)

OS	Driver version	Supported adapters			
		1/2 Gb	4 Gb	8 Gb	CNA
RHEL3 U2	6.07.02-RH2	√			
SLES8 SP3	6.05.00	√			
RHEL3 U4 RHEL3 U5	7.01.01-RH1	√			
SLES8 SP4	7.03.00	√			
RHEL3 U8 RHEL 3.9 Asianux 1.0 SP3	7.07.04b6	√	√		
Miracle Linux SE 4.0 RedFlag DC Server 5.0 Haansoft Linux 2006 Server	8.00.03b1	√			
RHEL4 U3 Miracle Linux SE 4.0 SP1 RedFlag DC Server 5.0 SP1 Haansoft Linux 2006 Server SP1	8.01.02-d4	√	√		
SLES9 SP3	8.01.02-sles	√	√		
RHEL4 U4 Asianux 2.0 SP2 OEL 4 U4	8.01.04-d7	√	√		

Table 4   Supported in kernel driver versions (page 2 of 2)

OS	Driver version	Supported adapters			
		1/2 Gb	4 Gb	8 Gb	CNA
SLES10 GA	8.01.04-k	√	√		
RHEL 4.5 OEL 4.5	8.01.04-d8	√	√		
RHEL 4.6 OEL 4.6	8.01.07-d4	√	√		
RHEL 4.7 Asianux 2.0 SP3 OEL 4.7	8.02.09-d0-rhel4.7-04	√	√		
RHEL5.0 Asianux 3.0 OEL 5.0	8.01.07-k1	√	√		
SLES 9 SP4	8.01.07.15	√	√		
SLES10 SP1	8.01.07-k3	√	√		
RHEL 5.1 Asianux 3.0 SP1 OEL 5.1	8.01.07-k7	√	√		
RHEL 5.2 OEL 5.2	8.02.00-k5-rhel5.2-03	√	√	√	
RHEL 5.2 OEL 5.2	8.02.00-k5-rhel5.2-04 **Note:** This driver is found in kernel errata 2.6.18-92.1.6.el5 and higher.	√	√	√	
SLES 10 SP2	8.02.00-k6-sles10.2-02	√	√	√	

What next?   If the driver version is not listed in Table 4, go to "Installation instructions for the out of kernel QLogic driver" on page 50.

If the driver version is listed in Table 4, refer to the appropriate section:

◆   "Installation instructions for the in kernel QLogic driver for Linux 2.4.x kernel" on page 42

◆   "Installation Instructions for the in kernel QLogic driver in Linux 2.6.x kernels" on page 45

Installation instructions for the in kernel QLogic driver for Linux 2.4.x kernel

The section contains the following instructions for enabling the QLogic driver:

Enabling the QLogic driver in RHEL 3.0

To enable this driver, follow these steps:

1. Ensure that the /etc/modules.conf file references an entry for each installed QLogic adapter.

   For each installed QLogic QLA23xx-series adapter, add an entry:

   alias scsi_hostadapter*N* qla2300

   where *N* is the sequential value of each QLogic adapter installed in the system, beginning with the number after the last host adapter number entry in the file. (The first host adapter entry begins with zero.)

   Example:

   ```
   alias scsi_hostadapter1 qla2300
   alias scsi_hostadapter2 qla2300
   alias eth0 tg3
   options scsi_mod max_scsi_luns=255
   scsi_allow_ghost_devices=1
   ```

2. Whenever /etc/modules.conf is modified, a new ramdisk should be created to reflect the changes made. Create a new ramdisk image to include the newly added references to the QLogic adapters:

   cd /boot
   mkinitrd -v initrd-*$1*.img *$1*

   where *$1* is the v2.4.x kernel version currently running.

   Example:

   mkinitrd -v initrd-2.4.21-27.ELsmp.img 2.4.21-27.ELsmp

3. Reboot the host.

Enabling the QLogic driver in SLES 8

In order for the driver to be loaded at boot time, the driver must be listed in the /etc/sysconfig/kernel and /etc/modules.conf files and the ramdisk must be updated to reflect the changes.

To enable the driver:

1. Edit /etc/sysconfig/kernel:

    vi /etc/sysconfig/kernel

    a. Add a reference to the QLogic qla2300.o driver in the INITRD_MODULES line:

    INITRD_MODULES="**scsi_mod sd_mod mptscsih qla2300 reiserfs**"

    b. Save the changes and quit from **vi**.

2. Edit /etc/modules.conf:

    vi /etc/modules.conf

    a. Add this entry for each installed QLogic adapter:

    alias scsi_hostadapter*N* qla2300

    where *N* is the sequential value of each QLogic adapter installed in the system, beginning with the number after the last host adapter number entry in the file. (The first host adapter entry begins with zero.)

    Ensure that the QLogic adapter entries are listed after the internal SCSI host adapter entry in both files.

    Example:

    ```
    alias parport_lowlevel parport_pc
    alias scsi_hostadapter sym53c8xx
    alias scsi_hostadapter1 qla2300
    alias scsi_hostadapter2 qla2300
    alias eth0 tlan
    options scsi_mod max_scsi_luns=255
    scsi_allow_ghost_devices=1
    ```

    b. Save the changes and quit from **vi**.

3. Create a new ramdisk to reflect the changes made:

```
cd /boot
mkinitrd -k vmlinuz-$1 -i initrd-$1
```

where *$1* is the v2.4.x kernel version currently running.

Example:

```
cd /boot
mkinitrd -k vmlinuz-2.4.21-295-smp -i initrd-2.4.21-295-smp
```

4. Reboot the system.

Installation Instructions for the in kernel QLogic driver in Linux 2.6.x kernels

If you are installing the OS after the adapter has been installed in the server, the OS will automatically detect the adapter, change the configure file, and build a RAM disk including the driver.

If you have completed a fresh installation of the OS without the adapter and plan to install it at a later time, or are installing an adapter in a server with an existing OS installed, refer to the following sections to enable this driver:

Enabling the QLogic driver in RHEL 4

To enable this driver:

1. Ensure that the /etc/modprobe.conf file references an entry for each installed QLogic adapter.

    For each installed QLogic adapter, add an entry:

    alias scsi_hostadapter*N* qla2xxx

    where *N* is the sequential value of each QLogic adapter installed in the system, beginning with the number after the last host adapter number entry in the file. (The first host adapter entry begins with zero.), qla2xxx is the driver name for the adapter

    Example:

    ```
    alias scsi_hostadapter3 qla2300
    alias scsi_hostadapter4 qla2322
    alias scsi_hostadapter5 qla2400
    alias scsi_hostadapter6 qla6312
    ```

    Note: QLA2300 manage QLA2310, QLA2340, and QLA2342
    QLA2322 manage QLE2360 and QLE2362
    QLA2400 manage QLA2460, QLA2462, QLE2460, and QLE2462
    QLA6312 manages QLE220

2. Whenever /etc/modprobe.conf is modified, a new ramdisk should be created to reflect the changes made. Create a new ramdisk image to include the newly added references to the QLogic adapters:

```
cd /boot
mkinitrd -v initrd-$1.img $1
```

where *$1* is the v2.6.x kernel version currently running.

Example:

```
mkinitrd -v initrd- 2.6.9-55.ELsmp.img 2.6.9-55.ELsmp
```

3. Reboot the host.

Enabling the QLogic driver in RHEL 5

To enable this driver:

1. Ensure that the /etc/modprobe.conf file references an entry for each installed QLogic adapter.

   For installed QLogic adapter, add an entry:

   ```
   alias scsi_hostadapterN qla2xxx
   ```

   where *N* is the sequential value of QLogic adapter installed in the system, beginning with the number after the last host adapter number entry in the file. (The first host adapter entry begins with zero.).

   Example:

   ```
   alias scsi_hostadapter1 qla2xxx
   ```

2. Whenever /etc/modprobe.conf/ is modified, a new ramdisk should be created to reflect the changes made. Create a new ramdisk image to include the newly added references to the QLogic adapters:

   ```
   cd /boot
   mkinitrd -v initrd-$1.img $1
   ```

   where *$1* is the v2.6.x kernel version currently running.

   Example:

   ```
   mkinitrd -v initrd- 2.6.18-8.el5.img 2.6.18-8.el5
   ```

3. Reboot the host.

Enabling the QLogic driver in SLES 9

In order for the driver to be loaded at boot time, the driver must be listed in the /etc/sysconfig/kernel and the ramdisk must be updated to reflect the changes. To enable the driver:

1. Edit /etc/sysconfig/kernel:

   ```
   vi /etc/sysconfig/kernel
   ```

   a. Add a reference to the QLogic driver in the INITRD_MODULES line:

      ```
      INITRD_MODULES="reiserfs qla2xxx_conf qla2xxx"
      ```

   b. Save the changes and quit from **vi**.

2. Create a new ramdisk to reflect the changes made:

   ```
   cd /boot
   mkinitrd -k vmlinuz-$1 -i initrd-$1
   ```

   where *$1* is the v2.6.x kernel version currently running.

   Example:

```
cd /boot
mkinitrd -k vmlinuz- 2.6.5-7.244-smp -i initrd- 2.6.5-7.244-smp
```

3. Reboot the system.

Enabling the QLogic driver in SLES 10

If the server install the OS without the adapter, in order for the driver to be loaded at boot time, the driver must be listed in the /etc/sysconfig/kernel and the ramdisk must be updated to reflect the changes. To enable the driver:

1. Edit /etc/sysconfig/kernel:

   ```
   vi /etc/sysconfig/kernel
   ```

   a. Add a reference to the QLogic qla2300.o driver in the INITRD_MODULES line:

```
INITRD_MODULES="piix megaraid_sas processor thermal fan reiserfs qla2xxx"
```

   b. Save the changes and quit from **vi**.

2. Create a new ramdisk to reflect the changes made:

```
cd /boot
mkinitrd -k vmlinuz-$1 -i initrd-$1
```

where *$1* is the v2.6.x kernel version currently running.

Example:

```
cd /boot
mkinitrd -k vmlinuz- 2.6.16.21-0.8-smp -i initrd-
2.6.16.21-0.8-smp
```

3. Reboot the system.

Supported out of kernel driver versions

Note: Only the QLogic v7.07.xx and the v8.01.xx driver provides support for the 4 GB-capable QLA24xx/QLE24xx-series adapters, not the less version driver.

Table 5 lists the QLogic out of kernel driver versions supported with corresponding OS updates. These driver versions require manually installation.

Table 5   QLogic out of kernel OS and driver version support

OS	Driver version
RHEL 3 U2 RHEL 3 U3 RHEL 3 U4 RHEL 3 U5	7.03.00
SLES 8 SP3 SLES 8 SP4	7.03.00
RHEL 3 U6 RHEL 3 U7	7.07.05
RHEL 4 RHEL 4 U1	8.00.03b-1
SLES 9 SP1	8.00.03b-1
SLES 9 SP2 RHEL 4 U2	8.01.06 **Note:** Does not support the 8 Gb adapters.
SLES 10 SP2 (FCoE adapters) RHEL 5 U2 (FCoE adapters)	8.02.14.01 **Note:** Supports only the QLogic FCoE adapters.

Refer to the latest *EMC Support Matrix* for specific qualified kernel versions and distributions.

Note: The support stated in the *EMC Support Matrix* supersedes versions listed in this document.

Installation instructions for the out of kernel QLogic driver

This section contains the following information for installing the out of kernel QLogic driver:

Downloading the QLogic v7.x/v8.x-series driver for the v2.4/v2.6.x kernel

Use the following procedure to download the EMC-approved QLogic driver from the QLogic website:

1. Use a web browser to access the EMC-approved section of the QLogic website at:

http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/Oem_EMC.aspx

2. Depending upon the EMC storage array being used, select the appropriate link from one of the two following categories:

   • EMC® CLARiiON, EMC Symmetrix and EMC Celerra® supported software

   • EMC CLARiiON AX100 supported software

3. After selecting a category, find the adapter model being used and select the link to be transferred to the page of resources for that adapter.

4. Find the desired and supported driver for the kernel version and distribution, and click the associated **Download** link to save the file.

Preinstallation instructions for the QLogic v7.xx.xx/v8.xx.xx driver

Perform the following steps prior to the installation:

1. Stop all I/O.

2. Unmount all filesystems attached to the QLogic driver.

3. If the Naviagent/CLI is installed and enabled on the host, then the Naviagent/CLI service must be stopped.

   To stop the Naviagent/CLI service, issue one of the two following commands:

   `/etc/init.d/naviagentcli stop`

   or

   `service naviagentcli stop`

4. If PowerPath is installed and enabled on the host, then the PowerPath service must be stopped.

   To stop the PowerPath service, issue one of the two following commands:

   `/etc/init.d/PowerPath stop`

   or

   `service PowerPath stop`

5. If the QLogic SANsurfer daemon qlremote is installed and enabled on the host, then the qlremote service must be stopped in order for the driver to be removed from the currently running kernel.

   To stop the qlremote service, issue one of the two following commands:

   `/etc/init.d/qlremote stop`

   or

   `service qlremote stop`

What next? Select a method to install the driver onto the Linux host:

For the QLogic v7.xx.xx/v8.xx.xx driver:

◆ To create a modular v7.xx.xx/v8.xx.xx driver using the DKMS RPM, refer to "Method 1: Installing the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic DKMS RPM" on page 52.

Use the QLogic DKMS RPM to compile and install the modular driver for Dell servers and attached to EMC storage arrays.

This method requires no manual edits for Dell servers attached to EMC storage arrays. By installing the DKMS RPM, the necessary files will be edited and the driver will be compiled and installed automatically.

◆ To create a modular v7.xx.xx/v8.xx.xx driver using the installation script, refer to "Method 2: Installing the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic installation script" on page 54.

Use the QLogic installation script to compile and install the modular driver onto the systems attached to EMC storage arrays.

This method requires no manual edits for systems attached to EMC storage arrays. By using the QLogic installation script, the necessary files are edited and the driver is compiled and installed automatically.

◆ To create a modular v7.xx.xx driver using the QLogic RMP, refer to "Method 3: Installing the QLogic v7.xx.xx driver via the QLogic RPM" on page 64.

Use the QLogic RPM to compile and install the modular driver.

This method requires no manual edits for systems attached to EMC storage arrays. By installing the QLogic RPM, the necessary files will be edited and the driver will be compiled and installed automatically.

Method 1: Installing the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic DKMS RPM

This section guides you through the process of installing and utilizing the DKMS RPM for Dell servers. The DKMS RPM will build and install the QLogic driver modules and will modify the /etc/modprobe.conf file with the entries similar to the following:

```
options qla2xxx ql2xfailover=0
alias scsi_hostadapter2 qla2100
alias scsi_hostadapter3 qla2200
alias scsi_hostadapter4 qla2300
alias scsi_hostadapter5 qla2322
alias scsi_hostadapter6 qla6312
```

The following are example steps to integrate the QLogic driver. Also refer to the README file in the driver package.

1. Boot into the qualified and supported kernel onto which the driver will be installed.

2. Obtain the qla2xxx-v8.xx.xx1-2dkms.tgz package from the EMC-approved section of the QLogic website as instructed under the "Downloading the QLogic v7.x/v8.x-series driver for the v2.4/v2.6.x kernel" on page 50.

3. Uncompress and extract the source files from the tar archive:

   ```
   [root@l82bi205 extra]# tar zxvf
   qla2xxx-v8.xx.xx-2dkms.tar.gz
   ```

   The initial decompression will provide you with the following:

   ```
   qla2xxx-v8.xx.xx-2/
   qla2xxx-v8.xx.xx-2/qla2xxx-v8.xx.xx-2dkms.noarch.rpm
   qla2xxx-v8.xx.xx-2/dkms-2.0.5-1.noarch.rpm
   qla2xxx-v8.xx.xx-2/README.dkms
   ```

4. Install the DKMS RPM:

   ```
   cd qla2xxx-v8.xx.xx-2
   rpm -ivh dkms-2.0.5-1.noarch.rpm

   Preparing...
   ######################################### [100%]
      1:dkms
   ######################################### [100%]
   ```

5. Install the QLogic driver RPM:

   ```
   rpm -ivh qla2xxx-v8.xx.xx-2dkms.noarch.rpm

   Preparing...
   ######################################### [100%]
      1:qla2xxx
   ######################################### [100%]
   ```

   An example of the console output reported by the RPM driver installation is as follows:

```
Creating symlink /var/lib/dkms/qla2xxx/v8.xx.xx/source
->/usr/src/qla2xxx-v8.xx.xx
DKMS: add Completed.
Loading/Installing pre-built modules for 2.6.9-5.EL (x86_64).
```

   A new ramdisk will be created automatically by the DKMS RPM installation.

6. Reboot the host.

Method 2: Installing the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic installation script

This section guides you through the process of installing and utilizing the QLogic installation script The script will build and install the driver and will modify the `/etc/modprobe.conf.local` and `/etc/sysconfig/kernel` files on SLES hosts.

Note: By default, the installation script will install the QLogic adapter SNIA API libraries and the SANsurfer CLI.

The following are example steps to install the QLogic driver via the installation script. Also refer to the README file in the driver package.

1. Boot into the qualified and supported kernel onto which the driver will be installed.

2. Obtain the `qlafc-linux-8.xx.xx-1-install.tgz` package from EMC-approved section of the QLogic website as instructed under the "Downloading the QLogic v7.x/v8.x-series driver for the v2.4/v2.6.x kernel" on page 50.

3. Uncompress and extract the source files from the tar archive:

   `tar zxvf qlafc-linux-8.xx.xx-1-install.tgz`

   The initial decompression provides the following:

```
qlafc-linux-8.xx.xx-1-install/
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.i386.rpm
qlafc-linux-8.xx.xx-1-install/set_driver_param
qlafc-linux-8.xx.xx-1-install/qla2xxx-v8.xx.xx-1.noarch.rpm
qlafc-linux-8.xx.xx-1-install/qlinstall
qlafc-linux-8.xx.xx-1-install/README.qlinstall
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.ppc64.rpm
qlafc-linux-8.xx.xx-1-install/revision.notes
qlafc-linux-8.xx.xx-1-install/scli-1.06.16-18.ia64.rpm
```

4. Install the QLogic driver via the installation script provided. When using the -i switch, the driver will be compiled, the current driver will be unloaded, and the newly compiled driver will be loaded into the kernel.

Note: EMC does not support the persistent binding implementation contained within the QLogic driver. As a result, it is recommended that the driver be compiled and installed without persistent binding enabled. This can be accomplished by using the 'dp' switch with the installation script.

Proceed with the installation.

```
cd qlafc-linux-8.xx.xx-1-install/./qlinstall -i -dp
```

The qlinstall installation script provides the following features:

◆ Installs the driver source RPM which installs the driver source code in the following path:

```
/usr/src/qlogic/<driver_version-rpm_release>
```

◆ Builds and installs the QLogic driver and configuration module (qla2xxx_conf.o) for the QLogic adapter model(s) installed in the system.

◆ Creates back-ups of important files and older drivers in the following directory:

```
/usr/src/qlogic/<driver version-rpm release>/backup
```

◆ Automatically loads the driver for the adapter model present.

◆ Builds and installs the ramdisk with the latest driver and configuration modules.

◆ Installs the QLogic SNIA API Library V2.

◆ Performs device discovery by default.

◆ Provides the following command line options:

• To invoke the device discovery at a later stage.

• To rebuild the ramdisk excluding or including QLogic adapter driver.

• To unload/load driver.

• To update the option ROM (BIOS, and so forth) on all adapters.

• To update the NVRAM on all adapters.

• To pass driver parameters. For example:
ql_port_down_retry

(Overrides NVRAM default)

- To invoke the SANsurfer CLI (SCLI).

The SANsurfer CLI (SCLI) is a command line interface that provides more flexibility for performing adapter configuration, device discovery, Option ROM and NVRAM updates, etc.

RHEL examples   An example of the console output reported by the QLogic installation script on RHEL hosts is as follows:

```
./qlinstall -i -dp


#**********************************************************#
#          QLogic HBA Linux Driver Installation        #
#              Version:  1.00.00b2pre9                         #
#**********************************************************#

Kernel version: 2.6.9-5.EL
Distribution: Red Hat Enterprise Linux AS release 4 (Nahant)

Found QLogic Fibre Channel Adapter in the system
    1: QLA2312
Installation will begin for following driver(s)
    1: qla2xxx version: v8.00.03

Preparing...
#################################################
qla2xxx
#################################################

QLA2XXX -- Building the qla2xxx driver...
\

QLA2XXX -- Installing the qla2xxx modules to
/lib/modules/2.6.9-5.EL/kernel/drivers/scsi/qla2xxx/...

Setting up QLogic HBA SNIA API library...

Unloading any loaded drivers
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300
Installing scli....
Preparing...
#################################################
scli
#################################################
Installation completed successfully.
```

```
Building default persistent binding using SCLI

Configuration saved on HBA port 0. Changes have been saved to
persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for
the saved configuration to take effect.
Configuration saved on HBA port 1. Changes have been saved to
persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for
the saved configuration to take effect.

Saved copy of /etc/modprobe.conf as
/usr/src/QLogic/v8.00.03-3/backup/modprobe.conf-2.6.9-5.EL-050505-161350.bak

Saved copy of /boot/efi/efi/redhat/initrd-2.6.9-5.EL.img as
/usr/src/QLogic/v8.00.03-3/backup/initrd-2.6.9-5.EL.img-050505-161350.bak

QLA2XXX -- Rebuilding ramdisk image...
Ramdisk created.

Reloading the QLogic FC HBA drivers....
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300

Target Information on all HBAs:
==============================


-------------------------------------------------------------------------------
HBA Port 0 - QLA2342  Port Name: 21-00-00-E0-8B-19-9A-54 Port ID: 6B-0F-00
-------------------------------------------------------------------------------
Path                      : 0
Target                    : 0
Device ID                 : 0x81
Port ID                   : 49-1B-00
Product Vendor            : DGC
Product ID                : RAID 3
Product Revision          : 0207
Node Name                 : 50-06-01-60-90-60-12-70
Port Name                 : 50-06-01-60-10-60-12-70
Product Type              : Disk
Number of LUN(s)          : 26
Status                    : Online
-------------------------------------------------------------------------------
Path                      : 0
Target                    : 1
Device ID                 : 0x82
```

```
Port ID                      : 48-1B-00
Product Vendor               : DGC
Product ID                   : RAID 3
Product Revision             : 0207
Node Name                    : 50-06-01-60-90-60-12-70
Port Name                    : 50-06-01-68-10-60-12-70
Product Type                 : Disk
Number of LUN(s)             : 26
Status                       : Online
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
HBA Port 1 - QLA2342  Port Name: 21-01-00-E0-8B-39-9A-54 Port ID: 6B-0E-00
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 0
Device ID                    : 0x81
Port ID                      : 49-1B-00
Product Vendor               : DGC
Product ID                   : RAID 3
Product Revision             : 0207
Node Name                    : 50-06-01-60-90-60-12-70
Port Name                    : 50-06-01-60-10-60-12-70
Product Type                 : Disk
Number of LUN(s)             : 26
Status                       : Online
-------------------------------------------------------------------------------
Path                         : 0
Target                       : 1
Device ID                    : 0x82
Port ID                      : 48-1B-00
Product Vendor               : DGC
Product ID                   : RAID 3
Product Revision             : 0207
Node Name                    : 50-06-01-60-90-60-12-70
Port Name                    : 50-06-01-68-10-60-12-70
Product Type                 : Disk
Number of LUN(s)             : 26
Status                       : Online
-------------------------------------------------------------------------------
#************************************************************#
#              INSTALLATION SUCCESSFUL!!                     #
#      QLogic HBA Linux driver installation completed.    #
#************************************************************#
```

File modifications on RHEL hosts

An example of the installation script's modifications to the file
/etc/modprobe.conf is as follows:

```
options qla2xxx ql2xfailover=0  ConfigRequired=0
remove qla2xxx /sbin/modprobe -r --first-time --ignore-remove
qla2xxx && { /sbin/modprobe -r --ignore-remove qla2xxx_conf; }
alias scsi_hostadapter1 qla2xxx_conf
```

```
        alias scsi_hostadapter2 qla2xxx
        alias scsi_hostadapter3 qla2300
```

SLES examples   An example of the console output reported by the QLogic installation script on SLES host is as follows:

```
./qlinstall -i -dp

#*********************************************************#
#            QLogic HBA Linux Driver Installation         #
#                  Version:  1.00.00b2pre4                #
#*********************************************************#

Kernel version: 2.6.5-7.151-smp
Distribution: SUSE LINUX Enterprise Server 9 (i586)

Found QLogic Fibre Channel Adapter in the system
    1: QLA2312
Installation will begin for following driver(s)
    1: qla2xxx version: v8.00.03

Preparing...
#################################################
qla2xxx
#################################################

QLA2XXX -- Building the qla2xxx driver...
\

QLA2XXX -- Installing the qla2xxx modules to
/lib/modules/2.6.5-7.151-smp/kernel/drivers/scsi/qla2xxx/...

Setting up QLogic HBA SNIA API library...

Unloading any loaded drivers
Unloaded module qla2300
Unloaded module qla2xxx_conf
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300
Installing scli....
Preparing...
#################################################
scli
#################################################
Installation completed successfully.

Building default persistent binding using SCLI
```

```
Configuration saved. Changes have been saved to persistent storage.
Please reload the QLA driver module/rebuild the RAM disk for the
saved configuration to take effect.
Configuration saved. Changes have been saved to persistent storage.
Please reload the QLA driver module/rebuild the RAM disk
for the saved configuration to take effect.
Saved copy of /etc/sysconfig/kernel as
/usr/src/qlogic/v8.00.03-1/backup/kernel-2.6.5-7.151-smp-042905-124100.bak

Saved copy of /etc/modprobe.conf.local as
/usr/src/qlogic/v8.00.03-1/backup/modprobe.conf-2.6.5-7.151-smp-042905-124100.ba
k

Saved copy of /boot/initrd-2.6.5-7.151-smp as
/usr/src/qlogic/v8.00.03-1/backup/initrd-2.6.5-7.151-smp-042905-124100.bak

QLA2XXX -- Rebuilding ramdisk image...
Ramdisk created.

Reloading the qlogic FC HBA drivers....
Unloaded module qla2300
Loading module qla2xxx_conf version: v8.00.03....
Loaded module qla2xxx_conf
Loading module qla2xxx version: v8.00.03....
Loaded module qla2xxx
Loading module qla2300 version: v8.00.03....
Loaded module qla2300

Target Information on all HBAs:
==============================


-------------------------------------------------------------------------------
HBA Port 1 - QLA2340  Port Name: 21-00-00-E0-8B-13-C0-1E Port ID: 6A-1A-13
-------------------------------------------------------------------------------
Path                     : 0
Target                   : 0
Device ID                : 0x81
Port ID                  : 6A-2E-13
Product Vendor           : DGC
Product ID               : LUNZ
Product Revision         : 0206
Node Name                : 50-06-01-60-90-60-12-5C
Port Name                : 50-06-01-6A-10-60-12-5C
Product Type             : Disk
Number of LUN(s)         : 1
Status                   : Online
-------------------------------------------------------------------------------
Path                     : 0
Target                   : 1
Device ID                : 0x82
Port ID                  : 6C-1B-13
```

```
Product Vendor           : DGC
Product ID               : RAID 3
Product Revision         : 0207
Node Name                : 50-06-01-60-90-60-12-70
Port Name                : 50-06-01-62-10-60-12-70
Product Type             : Disk
Number of LUN(s)         : 14
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 2
Device ID                : 0x83
Port ID                  : 61-1A-13
Product Vendor           : DGC
Product ID               : RAID 3
Product Revision         : 0207
Node Name                : 50-06-01-60-90-60-12-70
Port Name                : 50-06-01-6A-10-60-12-70
Product Type             : Disk
Number of LUN(s)         : 14
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 3
Device ID                : 0x84
Port ID                  : 74-4A-13
Product Vendor           : DGC
Product ID               : LUNZ
Product Revision         : 0206
Node Name                : 50-06-01-60-90-60-12-5C
Port Name                : 50-06-01-62-10-60-12-5C
Product Type             : Disk
Number of LUN(s)         : 1
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 4
Device ID                : 0x85
Port ID                  : 74-55-13
Product Vendor           : DGC
Product ID               : LUNZ
Product Revision         : 0217
Node Name                : 50-06-01-60-88-20-12-BB
Port Name                : 50-06-01-60-08-20-12-BB
Product Type             : Disk
Number of LUN(s)         : 1
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 5
Device ID                : 0x86
Port ID                  : 6A-3A-13
```

```
Product Vendor            : DGC
Product ID                : LUNZ
Product Revision          : 0217
Node Name                 : 50-06-01-60-88-20-12-BB
Port Name                 : 50-06-01-68-08-20-12-BB
Product Type              : Disk
Number of LUN(s)          : 1
Status                    : Online
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
HBA Port 0 - QLA2340  Port Name: 21-00-00-E0-8B-13-77-20 Port ID: 74-3B-13
-------------------------------------------------------------------------------
Path                      : 0
Target                    : 0
Device ID                 : 0x81
Port ID                   : 61-1A-13
Product Vendor            : DGC
Product ID                : RAID 3
Product Revision          : 0207
Node Name                 : 50-06-01-60-90-60-12-70
Port Name                 : 50-06-01-6A-10-60-12-70
Product Type              : Disk
Number of LUN(s)          : 14
Status                    : Online
-------------------------------------------------------------------------------
Path                      : 0
Target                    : 1
Device ID                 : 0x82
Port ID                   : 6A-2E-13
Product Vendor            : DGC
Product ID                : LUNZ
Product Revision          : 0206
Node Name                 : 50-06-01-60-90-60-12-5C
Port Name                 : 50-06-01-6A-10-60-12-5C
Product Type              : Disk
Number of LUN(s)          : 1
Status                    : Online
-------------------------------------------------------------------------------
Path                      : 0
Target                    : 2
Device ID                 : 0x83
Port ID                   : 6A-3A-13
Product Vendor            : DGC
Product ID                : LUNZ
Product Revision          : 0217
Node Name                 : 50-06-01-60-88-20-12-BB
Port Name                 : 50-06-01-68-08-20-12-BB
Product Type              : Disk
Number of LUN(s)          : 1
Status                    : Online
-------------------------------------------------------------------------------
Path                      : 0
```

```
Target                   : 3
Device ID                : 0x84
Port ID                  : 6C-1B-13
Product Vendor           : DGC
Product ID               : RAID 3
Product Revision         : 0207
Node Name                : 50-06-01-60-90-60-12-70
Port Name                : 50-06-01-62-10-60-12-70
Product Type             : Disk
Number of LUN(s)         : 14
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 4
Device ID                : 0x00
Port ID                  : 74-4A-13
Product Vendor           : DGC
Product ID               : LUNZ
Product Revision         : 0206
Node Name                : 50-06-01-60-90-60-12-5C
Port Name                : 50-06-01-62-10-60-12-5C
Product Type             : Disk
Number of LUN(s)         : 1
Status                   : Online
------------------------------------------------------------------------
Path                     : 0
Target                   : 5
Device ID                : 0x85
Port ID                  : 74-55-13
Product Vendor           : DGC
Product ID               : LUNZ
Product Revision         : 0217
Node Name                : 50-06-01-60-88-20-12-BB
Port Name                : 50-06-01-60-08-20-12-BB
Product Type             : Disk
Number of LUN(s)         : 1
Status                   : Online
------------------------------------------------------------------------


#************************************************************#
#               INSTALLATION SUCCESSFUL!!                    #
#       QLogic HBA Linux driver installation completed.      #
#************************************************************#
```

File modifications on SLES hosts

An example of the installation script's modifications to the file /etc/sysconfig/kernel is as follows:

```
INITRD_MODULES="cciss reiserfs qla2xxx_conf qla2xxx
qla2300"
```

An example of the installation script's modifications to the file `/etc/modprobe.conf.local` is as follows:

```
remove qla2xxx /sbin/modprobe -r --first-time
--ignore-remove
qla2xxx && { /sbin/modprobe -r --ignore-remove
qla2xxx_conf; }
options qla2xxx ql2xfailover=0 ConfigRequired=0
```

Method 3: Installing the QLogic v7.xx.xx driver via the QLogic RPM

This section guides you through the process of installing and utilizing the QLogic driver RPM. The RPM builds and installs the qla2300.o driver and modifies the `/etc/modules.conf` file.

In /etc/modules.conf, the host adapter line for the qla2300.o driver will be appended. The options line containing the addition of the scsi_allow_ghost_devices and max_scsi_luns parameters will also be appended to the file. This allows the host to correctly identify the disconnected LUN 0 that is reported when attached to CLARiiON storage arrays, and allows the SCSI stack to scan up to 255 devices.

The Navisphere Host Agent requires that the disconnected LUN 0 be reported.

The QLogic RPM creates the QLogic v7.xx.xx driver as a module.

The following is an example of steps to install the QLogic driver RPM along with example console output:

1. Boot into the qualified and supported kernel onto which the driver will be installed.

2. Obtain the qla2x00-v7.03.00-1.i686.rpm package from EMC-approved section of the QLogic website.

3. Install the QLogic driver:

```
[root@l82bi114 extra]# rpm -ivh qla2x00-v7.03.00-1.i686.rpm
Preparing... ########################################### [100%]
1:qla2x00 ########################################### [100%]

QLogic qla2300/qla2200 HBA driver installation supports the following distribution
and its different flavors :
Red Hat Advanced Server 2.1 / Red Hat Enterprise Linux 3.0 and SuSE SLES 8.
Please refer to SUPPORTED_KERNEL_VERSION.txt file in
/usr/src/qla2x00 path for details regarding different arch and kernel versions
supported
Installing qla2300 driver for 2.4.21-32.0.1.ELsmp...
Creating initial /usr/src/qla2x00/install.v7.03.00-1.log...
```

```
Please wait: Preparing qla2300 modular driver build
copying kernel-2.4.21-i686-smp.config to
/lib/modules/2.4.21-32.0.1.ELsmp/build/.config...
Building Kernel Dependencies
Make successful. File
/usr/src/qla2x00/make.2.4.21-32.0.1.ELsmp.v7.03.00-1.log created.
Saving copy of /etc/modules.conf as /etc/modules.conf.orig
install -d -o root -g root
/lib/modules/2.4.21-32.0.1.ELsmp/kernel/drivers/scsi/
install -o root -g root qla2200.o qla2300.o
/lib/modules/2.4.21-32.0.1.ELsmp/kernel/drivers/scsi/
install -o root -g root qla2200_conf.o
/lib/modules/2.4.21-32.0.1.ELsmp/kernel/drivers/scsi/
install -o root -g root qla2300_conf.o
/lib/modules/2.4.21-32.0.1.ELsmp/kernel/drivers/scsi/
depmod -a
make: Nothing to be done for
`/lib/modules/2.4.21-32.0.1.ELsmp/kernel/drivers/scsi/'.
depmod...
adding line: alias scsi_hostadapter2 qla2300_conf to /etc/modules.conf
adding line: alias scsi_hostadapter3 qla2300 to /etc/modules.conf
mkinitrd...
Installation of qla2300/qla2200 driver for 2.4.21-32.0.1.ELsmp
complete.
Ex: To load the qla2300 driver execute the following command:
# modprobe -v qla2300
Or Reboot the system for newly build ramdisk to load
qla2300 driver automatically for you
Installing the QLogic SNIA API library libqlsdm.so
in /usr/lib. API package is installed in the
/usr/src/qla2x00/ApiPkg path
Setting up QLogic HBA API library...
Please make sure the /usr/lib/libqlsdm.so file is not in use.
Done.
```

Example of the modified `/etc/modules.conf`:

```
[root@l82bi114 extra]# more /etc/modules.conf
alias eth0 e1000
alias eth1 e100
alias scsi_hostadapter mptbase
alias scsi_hostadapter1 mptscsih
alias usb-controller usb-uhci
options scsi_mod max_scsi_luns=255 scsi_allow_ghost_devices=1
post-remove qla2200 rmmod qla2200_conf
post-remove qla2300 rmmod qla2300_conf
alias scsi_hostadapter2 qla2300_conf
alias scsi_hostadapter3 qla2300
```

A new ramdisk is created automatically by the RPM installation.

4. Reboot the host.

Uninstallation methods for the QLogic v7.xx.xx/v8.xx.xx driver

This section describes how to successfully uninstall the QLogic v7.xx.xx/v8.xx.xx driver from a Linux host.

The method used to uninstall the driver is dependent upon the installation package:

Method 1: Uninstalling the QLogicv7.xx.xx/v8.xx.xx driver via QLogic DKMS RPM

This section provides guidance for uninstalling the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic DKMS RPM package. The driver may be removed from the system with the 'e' switch for the RPM command.

The following are example steps to uninstall the QLogic driver. Also refer to the README file in the driver package.

1. Verify the driver names by querying the DKMS RPMs.

```
[root@l82bi235 qla2x00-v8.xx.xx]# rpm -qa | grep dkms
qla2x00-v8.xx.xxdkms
dkms-2.0.0-1
```

2. Uninstall the QLogic driver RPM using the following command:

```
root@l82bi235 qla2x00-v8.xx.xx]# rpm -ev
qla2x00-v8.xx.xxdkms
```

An example of the console output reported by the driver RPM removal is as follows:

3. Verify that the /etc/modprobe.conf and /etc/modprobe.conf.local files contain the information necessary for the server to boot and that a new ramdisk has been created.

4. Reboot the host.

Method 2: Uninstalling the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic installation script

This section provides guidance for uninstalling the QLogic v7.xx.xx/v8.xx.xx driver via the QLogic installation script. The driver may be removed from the system with the 'u' switch for the `qlinstall` script.

The following are example steps to uninstall the QLogic driver. Also refer to the README file in the driver package

1. Change to the directory where the installation script is located.

   ```
   [root@l82bi116 /]# cd /qlafc-linux-8.xx.xx-install
   ```

2. Uninstall the QLogic driver with the following command:

   ```
   [root@l82bi116  qlafc-linux-8.xx.xx-install]#
   ./qlinstall -u
   ```

   An example of the console output reported by the driver removal is as follows:

3. Verify that the `/etc/modprobe.conf` file contains the information necessary for the server to boot and that a new ramdisk has been created. If the ramdisk has not been created as in the example above, create one.

   ```
   cd /boot
   mkinitrd -v initrd-$1.img $1
   ```

   where *$1* is the currently running v2.6.x kernel version.

   Example:

   ```
   cd /boot
   mkinitrd -v initrd-2.6.9-11.ELsmp.img 2.6.9-11.ELsmp
   ```

4. Reboot the host.

Method 3: Uninstalling the QLogic v7.xx.xx driver via the QLogic RPM

This section provides guidance for uninstalling the QLogic v7.xx.xx driver RPM. The QLogic RPM may be used to remove the driver with the e switch for the RPM command.

The following are example steps:

1. Verify the currently loaded QLogic driver RPM:

   ```
   [root@l82bi235 extra]# rpm -qa | grep qla
   qla2x00-v7.03.00-1
   ```

2. Remove the driver using the RPM command:

   ```
   [root@l82bi235 extra]# rpm -ev qla2x00-v7.03.00-1
   ```

3. Verify that the /etc/modules.conf file contains the information necessary for the server to boot and that a new ramdisk has been created. If the ramdisk has not been created, create one:

   ```
   cd /boot
   mkinitrd -v initrd-$1.img $1
   ```

   where *$1* is the v2.4.x kernel version currently running.

   Example:

   ```
cd /boot
mkinitrd -v initrd-2.4.21-27.0.4.ELsmp.img 2.4.21-27.0.4.ELsmp
   ```

4. Reboot the host.

QLogic SANsurfer and SANsurfer CLI

QLogic's SANsurfer program is a GUI-based utility and the SANsurfer CLI is a text-based utility. Both applications may be installed on any Linux system and used to manage, configure, and update the EMC-approved QLogic adapters.

Complete documentation and the EMC-qualified versions of SANsurfer and the SANsurfer CLI are available for download from the EMC-approved section of the QLogic website.

http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/Oem_EMC.aspx

- ◆ For 4 GB QLogic adapters, the minimum required versions are:
  - • SANsurfer - 2.0.30b52
    - – SANsurfer CLI - 1.06.016 build 23
- ◆ For 8 GB QLogic adapters, the minimum required versions are:
  - • SANsurfer - 2.0.32b
    - – SANsurfer CLI - 1.06.016 build 23

Note: For SANsurfer usage with Asianux 3.0 SP1 you will need to turn on the portmap service. This is accomplished by issuing the following Linux command as the root user.

chkconfig portmap on
service portmap start

IOCTL module for RHEL4

The RHEL4 in kernel driver needs the ioctl module to support SANsurfer. Using out of kernel driver on RHEL4 does not have this issue. For RHEL4 U3 and RHEL4 U4, the out of kernel ioctl module needs to installed before you use SANsurfer.

Note: For RHEL4 U5 or above, the ioctl module is hooked up with the OS and needs to be loaded manually.

The following is an example procedure to install the ioctl on RHEL4 U3 and RHEL4 U4:

1. Download QLogic Linux IOCTL Module from EMC- approved site on the QLogic website.

2. Enter **tar –xvf qioctl-install.tar**

3. Enter **qioctl-install –install**

The following is an example of load IOCTL module on RHLE4 U5 and above with command:

```
modprobe -v qioctlmod
```

RPM packages needed for RHEL5

To run the SANsurfer installer under Redhat 5 Linux, if the default install is selected, the following RPMs need to be installed:

```
compat-libstdc++-33-3.2.3-61.<arch>.rpm
libXp-1.0.0-8.<arch>.rpm
```

Note: On x86_64 make sure to load 32 bit libs.

QLogic v7.x and v8.x series driver parameters

The QLogic driver contains a number of parameters that may be modified to perform failover functionality or to enhance performance.

QLogic v7.x series driver parameters

The QLogic and EMC recommended values are in Table 6 and descriptions of the parameters follow the table.

The values to which these parameters are set are dependent upon the environment and the type of applications and subsequent I/O being used on the system. Currently, the values in the EMC default recommendations column apply to both PowerPath and non-HA connections. Keep in mind that these are merely guidelines as each environment differs.

Note: EMC does not support the failover functionality within the QLogic driver. As a result, parameters related to the failover functionality are not used by EMC.

The changes to the parameters do not take effect until the driver is reloaded or the host is rebooted.

Note: 0 = disabled; **1** = enabled

Table 6   QLogic v7.x series driver parameters (page 1 of 3)

Parameters	QLogic default values	EMC default recommendations
ql2xopts	<string>	<string>
General driver parameters:		
ql2xfailover	0	0
ql2xmaxqdepth	32	32
ql2xmaxsectors	512	512
ql2xmaxsgs	32	32
ql2xlogintimeout	20 seconds	20 seconds

Table 6   QLogic v7.x series driver parameters (page 2 of 3)

Parameters	QLogic default values	EMC default recommendations
qlport_down_retry	0 (uses value specified in NVRAM)	0 (uses value specified in NVRAM)
ql2xretrycount	20 (standard mode)/30 (failover mode)	20 (standard mode)
max_srbs	4096	4096
displayConfig	1	1
ql2xintrdelaytimer	3	3
retry_gnnft	10	10
ConfigRequired	0	0
Bind	0 (by Portname)/1 (by PortID)	0 (by Portname)
ql2xsuspendcount	10 6-second suspend iterations	10 6-second suspend iterations
ql2xdevflag	0	0
qfull_retry_count	16 retries	16 retries
qfull_retry_delay	2 seconds	2 seconds
extended_error_logging	0	0
ql2xplogiabsentdevice	0 (no PLOGI)	0 (no PLOGI)
ql2xfdmienable	0 (no FDMI)	0 (no FDMI)
qlogin_retry_count	0	0
ql2xioctltimeout	66	66
ql2xprocessnotready	1	1
ql2xuseextopts	0	0
Failover-Specific Parameters:		
MaxPathsPerDevice	8	8
MaxRetriesPerPath	3	3
MaxRetriesPerIo	(MaxRetriesPerPath * MaxPathsPerDevice) + 1	(MaxRetriesPerPath * MaxPathsPerDevice) + 1

EMC Host Connectivity with QLogic Fibre Channel and iSCSI (HBAs) and (CNAs) for the Linux Environment

Table 6   QLogic v7.x series driver parameters (page 3 of 3)

Parameters	QLogic default values	EMC default recommendations
qlFailoverNotifyType	0	0
recoveryTime	10 seconds	10 seconds
failbackTime	5 seconds	5 seconds

Description of QLogic v7.x-series driver parameters

When attaching to CLARiiON and Symmetrix storage systems, EMC recommends that the ConfigRequired and ql2xfailover parameters be set to zero.

General driver parameters

◆ ql2xopts: string that defines additional driver options and persistent binding info.

◆ ql2xfailover: determines whether the failover functionality is disabled or enabled.

> **Note:** EMC does not support the failover functionality of the QLogic driver.

◆ ql2xmaxqdepth: defines the maximum queue depth reported to the SCSI mid-layer per device and specifies the number of outstanding requests per LUN.

◆ ql2xmaxsectors: defines the maximum number of sectors reported to the SCSI mid-layer per request for the adapter.

◆ q2xmaxsgs: defines the maximum number of scatter-gather entries reported to the SCSI mid-layer per request for the adapter.

◆ ql2xlogintimeout: defines the login timeout value in seconds, during the initial login.

◆ qlport_down_retry: defines the maximum number of command retries to a port that returns a PORT DOWN status.

◆ ql2xretrycount: defines the maximum number of SCSI mid-layer retries allowed per command.

◆ max_srbs: defines the maximum number of simultaneous commands allowed for an adapter.

◆ displayConfig: defines whether to display the current driver configuration. If 1, then the configuration used in /etc/modules.conf is displayed.

- ◆ `ql2xintrdelaytimer`: defines the amount of time for the firmware to wait before generating an interrupt to the host as notification of the request completion.

- ◆ `retry_gnnft`: defines the number of times to retry GNN_FT in order to obtain the Node Name and PortID of the device list.

- ◆ `ConfigRequired`: If set to 1, then only devices configured and passed through the `ql2xopts` parameter are presented to the OS.

- ◆ `Bind`: defines the method for target persistent binding method. If set to 0, then the Portname is used; if set to 1, the PortID is used.

- ◆ `ql2xsuspendcount`: defines the number of 6-second suspend iterations to perform while a target returns a NOT_READY status.

- ◆ `ql2xdevflag`: defines whether to display the abbreviated persistent binding statements.

- ◆ `qfull_retry_count`: defines the number of retries to perform on a queue full status from a device.

- ◆ `qfull_retry_delay`: defines the number of seconds to delay on queue full status from a device.

- ◆ `extended_error_logging`: defines whether to enable extended error logging.

- ◆ `ql2xplogiabsentdevice`: defines whether to enable a PLOGI to devices that are not present after a fabric scan. Per QLogic, this is needed for several broken switches.

- ◆ `ql2xfdmienable`: defines whether FDMI registration is enabled.

- ◆ `qlogin_retry_count`: defines whether the login retry count will be modified.

- ◆ `ql2xioctltimeout`: defines the IOCTL timeout value in seconds for pass-through commands.

- ◆ `ql2xprocessnotready`: defines whether the driver handles NOT_READYs.

- ◆ `ql2xuseextopts`: defines whether the driver will use the extended options saved in the module object itself, even if a string is defined via `ql2xopts`.

Failover-specific parameters

- ◆ `MaxPathsPerDevice`: defines the maximum number of paths to a device.

- ◆ `MaxRetriesPerPath`: defines the number of retries to perform on the current path before failing over to the next path in the list.

◆ MaxRetriesPerIo: defines the total number of retries to perform before failing the command and returning a DID_NO_CONNECT selection timeout to the OS.

◆ qlFailoverNotifyType: defines the type of failover notification mechanism to use when a failover or failback occurs.

◆ recoveryTime: defines the recovery time in seconds required before commands may be sent to a target device after a failback is performed.

◆ failbackTime: defines the delay in seconds before a failback is performed to ensure that all paths are available.

Setting the parameter values

The values of the general driver parameters may be modified at the driver load time. This modification may be performed at the command line or by adding the parameters to the /etc/modules.conf file and including them in the ramdisk.

When attaching to CLARiiON and Symmetrix storage systems, EMC recommends that the ConfigRequired and ql2xfailover parameters be set to zero in the /etc/modules.conf file.

1. To load the QLogic driver onto the system with the parameters at the command line, use:

   modprobe qla2300.o extended_error_logging=1

   In order for the modular driver to be loaded at boot time with these parameters set to 0, a separate options line needs to be added to the /etc/modules.conf file.

2. Edit the file:

   vi /etc/modules.conf

3. Add the options line for the appropriate driver settings.

   ```
   options qla2300 extended_error_logging=1
   ```

Example:

```
alias parport_lowlevel parport_pc
alias eth0 eepro100
alias scsi_hostadapter cpqarray
alias scsi_hostadapter1 cpqarray
alias scsi_hostadapter2 qla2300
alias scsi_hostadapter3 qla2300
options scsi_mod max_scsi_luns=255 scsi_allow_ghost_devices=1
options qla2300 extended_error_logging=1
```

4. After the modification to /etc/modules.conf has been made, a new ramdisk needs to be created and the host rebooted.

   To create a new ramdisk, type the mkinitrd command:

   • For Red Hat, type:

     cd /boot
     mkinitrd –v initrd-*$1*.img *$1*

     where *$1* is the v2.4.x kernel version currently running.

     Example:

     cd /boot
     mkinitrd initrd-2.4.21-37.ELsmp.img 2.4.21-37.ELsmp

   • For SuSE, type:

     cd /boot
     mkinitrd –i initrd-*$1* -k vmlinuz-*$1*

     where *$1* is the v2.4.x kernel version currently running.

     Example:

     cd /boot
     mkinitrd -i initrd-2.4.21-286-smp -k vmlinuz-2.4.21-286-smp

5. Reboot the host.

QLogic v8.x-series driver parameters

The QLogic driver contains a number of parameters that may be modified, such as debug.

⚠ **IMPORTANT**

EMC does not recommend changing these parameters and defaults should be left as is.

Setting the parameter values

The values of the general driver parameters may be modified at the driver load time. This modification may be performed at the command line or by adding the parameters to the `/etc/modprobe.conf` file on RHEL 4.0 hosts and the `/etc/modprobe.conf.local` file on SLES 9 hosts and including them in the ramdisk.

Note: When attaching to CLARiiON and Symmetrix storage arrays, EMC recommends that the ConfigRequired and ql2xfailover parameters be set to zero in the /etc/modules.conf file.

◆ To load the QLogic driver onto the system with the parameters at the command line, use:

```
modprobe qla2300 extended_error_logging=1
```

◆ In order for the modular driver to be loaded at boot time with these parameters set to 0, a separate options line needs to be added to the `/etc/modprobe.conf` file on RHEL 4.0 hosts and the `/etc/modprobe.conf.local` file on SLES 9 hosts.

1. Edit the file appropriate for the distribution being used.

   • For Red Hat distributions, edit:

     ```
     vi /etc/modprobe.conf
     ```

   • For SuSE distributions, edit:

     ```
     vi /etc/modprobe.conf.local
     ```

2. Add the options line for the appropriate driver settings.

   options qla2xxx extended_error_logging=1

   For example, the `/etc/modprobe.conf` file on RHEL 4.0 might look as follows:

   ```
   alias eth0 tg3
   alias eth1 tg3
   alias scsi_hostadapter megaraid_mbox
   alias scsi_hostadapter2 qla2xxx
   alias scsi_hostadapter3 qla2xxx_conf
   alias scsi_hostadapter4 qla2300
   options qla2xxx extended_error_logging=1
   ```

   And the `/etc/modprobe.conf.local` file on SLES 9 might look as follows:

```
options qla2xxx extended_error_logging=1
```

3. After the modification to the file appropriate for your distribution, a new ramdisk needs to be created and the host rebooted.

   • For Red Hat distributions, use:

   cd /boot
   mkinitrd -v initrd-*$1*.img *$1*

   where *$1* is the currently running v2.6.x kernel version.

   Example:

   ```
   cd /boot
   mkinitrd -v initrd-2.6.9-22.ELsmp.img
   2.6.9-22.ELsmp
   ```

   • For SuSE distributions, use:

   cd /boot
   mkinitrd -i initrd-$1 -k vmlinuz-$1

   where $1 is the currently running v2.6.x kernel version.

   Example:

   ```
   cd /boot
   mkinitrd -i initrd-2.6.5-7.201smp -k
   vmlinuz-2.6.5-7.201smp
   ```

4. Reboot the host.

Displaying the QLogic v8.x-series driver parameter information via modinfo

The QLogic v8.x-series driver parameters and their definitions may be viewed by using the modinfo command. This command may be used on any Linux kernel module.

Note: EMC does not support the failover functionality of the QLogic driver.

The modinfo command may be run on the qla2300, qla2xxx_conf, and qla2xxx modules. However, the parameter information is reported only by the qla2xxx module.

An example of the console output displayed when modinfo is run on the qla2300 module is as follows:

```
[root@l82bi205 ~]# modinfo qla2300
filename:
/lib/modules/2.6.9-22.ELsmp/kernel/drivers/scsi/qla2xxx/qla2300.ko
```

```
version:          8.01.06
license:          GPL
description:      QLogic ISP23xx FC-SCSI Host Bus Adapter driver
author:           QLogic Corporation
alias:            pci:v00001077d00002312sv*sd*bc*sc*i*
alias:            pci:v00001077d00002300sv*sd*bc*sc*i*
depends:          qla2xxx
vermagic:         2.6.9-22.ELsmp SMP gcc-3.4
```

An example of the console output displayed when `modinfo` is run on the `qla2xxx` module is as follows:

```
[root@l82bi205 ~]# modinfo qla2xxx
filename:
/lib/modules/2.6.9-22.ELsmp/kernel/drivers/scsi/qla2xxx/qla2xxx.ko
version:          8.01.06
license:          GPL
description:      QLogic Fibre Channel HBA Driver
author:           QLogic Corporation
parm:             ql2xfdmienable:Enables FDMI registratons Default is 0 - no FDMI.
1 - perfom FDMI.
parm:             ql2xfwloadbin:Option to enable loading of ISP24xx firmware via the
request_firmware() (hotplug) interface.  If enabled, a file, ql2400_fw.bin,
(containing the firmware image) should be hotplug accessible.
parm:             extended_error_logging:Option to enable extended error logging,
Default is 0 - no logging. 1 - log errors.
parm:             ql2xioctltimeout:IOCTL timeout value in seconds for pass-thur
commands. Default is 66 seconds.
parm:             ql2xprocessrscn:Option to enable port RSCN handling via a series
of lessfabric intrusive ADISCs and PLOGIs.
parm:             ql2xprocessnotready:Option to disable handling of NOT-READY in the
driver. Default is 1 - Handled by the driver. Set to 0 - Disable the handling
inside the driver
parm:             ql2xloginretrycount:Specify an alternate value for the NVRAM login
retry count.
parm:             ql2xdoinitscan:Signal mid-layer to perform scan after driver load:
0 -- no signal sent to mid-layer.
parm:             ql2xsuspendcount:Number of 6-second suspend iterations to perform
while a target returns a <NOT READY> status.  Default is 10 iterations.
parm:             Bind:Target persistent binding method: 0 by Portname (default); 1
by PortID; 2 by Nodename.
parm:             ConfigRequired:If 1, then only configured devices passed in through
theql2xopts parameter will be presented to the OS
parm:             ql2xintrdelaytimer:ZIO: Waiting time for Firmware before it
generates an interrupt to the host to notify completion of request.
parm:             ql2xenablezio:Option to enable ZIO:If 1 then enable it otherwise
use the default set in the NVRAM. Default is 0 : disabled
parm:             ql2xplogiabsentdevice:Option to enable PLOGI to devices that are
not present after a Fabric scan.  This is needed for several broken
switches.Default is 0 - no PLOGI. 1 - perfom PLOGI.
parm:             displayConfig:If 1 then display the configuration used in
/etc/modprobe.conf.
```

```
parm:           ql2xretrycount:Maximum number of mid-layer retries allowed for a
command.  Default value is 20,
parm:           qlport_down_retry:Maximum number of command retries to a port that
returnsa PORT-DOWN status.
parm:           ql2xlogintimeout:Login timeout value in seconds.
parm:           ql2xmaxqdepth:Maximum queue depth to report for target devices.
parm:           ql2xtgtemul:Enable/Disable target combining emulation.Default : 1
Enable target failover emulation for targets created by lunid matching       : 0
Disable target failover emulation
parm:           ql2xexcludemodel:Exclude device models from being marked as failover
capable.Combine one or more of the following model numbers into an exclusion mask:
0x20 - HSV210, 0x10 - DSXXX, 0x04 - HSV110, 0x02 - MSA1000, 0x01 - XP128.
parm:           ql2xlbType:Load Balance Method : (0) None (1) static load balance
and Default : 0  All the luns exposed on the first active path          : 1  For
static load balance across active optimised               controller ports
parm:           qlFailoverNotifyType:Failover notification mechanism to use when
a failover or failback occurs.
parm:           MaxRetriesPerIo:How many total retries to do before failing the
command and returning to the OS with a DID_NO_CONNECT status.
parm:           MaxRetriesPerPath:How many retries to perform on the current path
before failing over to the next path in the path list.
parm:           MaxPathsPerDevice:Maximum number of paths to a device.  Default 8.
parm:           failbackTime:Delay in seconds before a failback is performed.
parm:           recoveryTime:Recovery time in seconds before a target device is
sent I/O after a failback is performed.
parm:           ql2xfailover:Driver failover support: 0 to disable; 1 to enable.
alias:          pci:v00001077d00002432sv*sd*bc*sc*i*
alias:          pci:v00001077d00002422sv*sd*bc*sc*i*
depends:        scsi_mod
vermagic:       2.6.9-22.ELsmp SMP gcc-3.4
```

Updating the
CEE/Menlo Firmware

This chapter provides information on updating the CEE/Menlo firmware for Fibre Channel over Ethernet adapters.

Updating the QLogic CEE /Menlo firmware for FCoE adapters

FCoE adapters include an additional chip component which requires the latest supported firmware. This chip is commonly referred to as a CEE (converged enhanced ethernet) or "Menlo" chip, the purpose of which is to handle the convergence of storage (FC) and network (IP) traffic over a single ethernet interface.

To update the CEE/Menlo firmware on the CNAs, follow these steps:

1. Ensure that QLogic SANsurfer and SANsurfer CLI is installed. Refer to "Upgrading the adapter BIOS" on page 29 for installation instructions.

2. Copy the appropriate CEE/Menlo firmware file from the CD-ROM or the EMC-approved section of the QLogic website to the appropriate directory,
   /opt/QLogic_Corporation/SANsurferCLI

3. Execute the command
   /opt/QLogic_Corporation/SANsurferCLI/scli.

4. Select options **10** (Utilities), then **6** (FCoE Utility), then **1** (FCoE Engine), and then **1** (Update Firmware).

5. The utility prompts to enter a file name. Enter the name of the CEE/Menlo firmware file obtained in Step 2. The utility should report the update has completed successfully.

6. Press **Enter** to return to the main menu, then select options **0** (Return to Main Menu), then **15** to exit the SANsurfer CLI utility.

7. Reboot the host for the new CEE/Menlo firmware update to take effect.

6

Connecting to the Storage

This chapter provides information on connecting to the storage.

Zoning and connection planning in a fabric environment

In a fabric environment, the user should plan for the switch topology, target-to-hosts mapping, and the zone.

Planning procedure

The recommended procedure is as follows:

1. Draw the connectivity among the hosts, switch, and storage array to verify the correct fabric configuration.

2. Configure the zone capability in the switch. If connecting to EMC Connectrix, refer to the *Connectrix Enterprise Storage Network System Planning Guide* for information on the zone configuration.

Establishing connectivity to the storage array

Once the adapter has been properly configured, connectivity will need to be established between the adapter and the storage array. In the case, where the adapter will be directly connected to the storage array, the cable can just be attached. However, when attaching to an FC or FCoE switch, several additional configuration steps are needed.

These include zoning the port on the adapter to the correct port on the storage array, as well as configuring LUN Masking on the array.

For additional information on how to perform these additional installation steps, refer to the *EMC Networked Storage Topology Guide*, located at: http://elabnavigator.EMC.com.

Note: You will need to reload the driver or reboot the server so the new targets and LUNs may be scanned and acquired by the Linux SCSI subsystem.

What next? Follow the instructions in "Device reconfiguration procedures" on page 105.

Configuring a Boot Device on an EMC Storage Array

EMC supports booting Linux from an EMC storage array through an EMC-qualified QLogic Fibre Channel HBA. (Refer to the *EMC Support Matrix* for specific HBAs, BIOS revisions, and drivers.)

Cautions and restrictions for booting from EMC storage array

⚠ **CAUTION**

If Linux loses connectivity long enough, the disks disappear from the system. To prevent further data from being lost in a situation like this, EMC recommends that the error behavior be changed from *continue* to *remount read-only*. To make this change, consult the manpage for tune2fs. A hard reboot is required to bring the system back to a usable state.

⚠ **CAUTION**

You should configure the host with enough memory to eliminate the need for a swap partition. EMC cannot recommend an amount of memory as this varies greatly depending upon the environment.

EMC recommends shutting down the host server during any maintenance procedures that could make the boot disk unavailable to the host. Any of these events could crash a system booting from an EMC storage array.

CLARiiON-specific cautions and restrictions

◆ Lost connection to CLARiiON storage array (pulled or damaged cable connection).

◆ CLARiiON service and upgrade procedures, such as on-line CLARiiON FLARE upgrades and/or configuration changes.

◆ CLARiiON SP failures, including failed lasers.

◆ CLARiiON storage array power failure.

◆ Storage Area Network failures, such as failures in Fibre Channel switches, switch components, or switch power.

◆ Storage area network service and upgrade procedures, such as firmware upgrades or hardware replacements.

◆ Trespass of a CLARiiON LUN from one SP to the other.

Symmetrix-specific cautions and restrictions

- ◆ Lost connection to Symmetrix storage array (pulled or damaged cable connection).

- ◆ Symmetrix service and upgrade procedures, such as on-line Symmetrix microcode upgrades and/or configuration changes.

- ◆ Symmetrix director failures, including failed lasers.

- ◆ Symmetrix storage array power failure.

- ◆ Storage area network service and upgrade procedures, such as firmware upgrades or hardware replacements.

Common limitations

Boot configurations must not deviate from the following limitations established by EMC:

- ◆ The EMC Storage device must have enough disk space to hold the Linux operating system.

- ◆ A maximum of 32 volumes may be configured on the EMC storage array port that will be used to boot Linux.

- ◆ EMC recommends that you install, rather than upgrade, the kernel-source and kernel UP, SMP, and Hugemem RPMs.

- ◆ For RHEL4 U4, 4 Gb adapter driver will not load automatically at boot time. The adapter will not detect boot LUN and give no device found error.

  To force load 4 Gb driver, at the point where it says no device found, click on **ADD DEVICE**, then select **QLA2400**.

- ◆ Veritas VxVM/DMP is not supported on Linux hosts booting from EMC storage arrays.

- ◆ Hosts booting from an EMC storage array are limited to the use of one adapter.

- ◆ EMC recommends, although it is not required, that the Symmetrix or CLARiiON device that is to contain the Master Boot Record (MBR) for the host have a lower logical unit number (LUN) than any other device visible to the host.

  Note that this includes the following cases:

  - • Volume Logix database device when using Volume Logix in a Symmetrix environment — The installer will fail to write the MBR to this device, as it is write-protected.

    - – To force the installer to avoid an attempt to write to this device, EMC recommends masking the LUN. The administrative host must first initialize the Volume Logix database. The LUN may then be masked by modifying the active configuration file to enable the 'fba flag2' to restrict access to the Volume Logix database.

    - – An alternative to masking the VCM DB is to map the Volume Logix database device so that it is the highest LUN presented to the host. Be aware that the LUN number should not be higher than 254 (FE).

Note: The EMC-recommended method is to use LUN masking.

- CLARiiON ghost LUN — If the LUN 0 presented to a SCSI path is not owned by the SP attached to that path, a disconnected LUN 0 (ghost LUN) will be presented. The ghost LUN is not write-enabled so that the MBR cannot be written to it. Always ensure that the boot LUN is owned by the correct SP and does not trespass at any time; trespass of the boot LUN would result in a system crash.

◆ When attaching the Linux host to an EMC storage array, use the adapter in the lowest-numbered PCI slot in the server. To keep the configuration and installation simple, it is recommended that only that single adapter be cabled to the arrays. Ensure that the boot BIOS has been applied to the adapter.

◆ The installer installs the boot block onto only the first disk it sees. This includes SCSI and IDE drives in the server. If only EMC storage array devices attached to the system, the boot BIOS should be set to the first LUN the adapter sees. If there are other local disks in the system and depending on how Linux discovers the controllers and drives, the boot block may need to be on a local disk.

CLARiiON-specific limitations

◆ Prior to the installation on a CLARiiON LUN, the Linux host must have been manually registered on the array and assigned to a Storage Group. At least one LUN must be bound to the host's Storage Group and owned by the SP connected to the adapter being used for the fabric boot. The CLARiiON storage array SP should be zoned to the lowest-numbered channel in the server and the lowest-numbered path to the boot LUN must be the active path.

◆ EMC recommends, although it is not required, that the boot LUN be assigned Host LUN ID 0.

◆ During the installation procedure, it is recommended, but not required, that only one LUN be assigned to the Storage Group for ease of use. Once the installation has completed, additional LUNs may be added to the Storage Group.

◆ Booting from the SAN requires the use of a Navisphere Management station with the Navisphere Manager or NaviCLI installed. The stations must be separate from the boot server, but networked to the CLARiiON storage array.

Symmetrix-specific limitations

◆ When attached to a Symmetrix, the physical-to-logical split must be 1:8 or less (1:7, 1:6, etc.). EMC supports the use of any LUN from 00 through FF as a boot disk.

◆ Prior to the installation on a Symmetrix LUN, the Linux host adapter must have successfully logged into the array. Using Solutions Enabler from another system, assign a minimum of one LUN to the host.

◆ During the installation procedure, it is recommended, but not required, that only one LUN be assigned to the host for ease of use. Once the installation has completed, additional LUNs may be assigned to the host.

Configuring a Symmetrix boot device

This section describes how to install an EMC-qualified version of Linux onto an EMC Symmetrix storage array connected to an Intel-based x86 and x86_64 class systems and AMD Opteron-based x86_64 class systems.

Preparing the Symmetrix storage array

◆ It is recommended that Volume Logix be enabled on the Symmetrix storage array for LUN masking purposes.

◆ During the installation procedure, only one LUN should be allocated to the host, so that the boot LUN may be identified easily. After the OS installation, additional LUNs may be allocated.

◆ Create a zone that includes the WWPN of the adapter to be used and one FA port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.

Preparing the host

◆ Create a zone that includes the WWPN of the adapter to be used and one FA port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.

◆ The PCI Fibre Channel adapter must be the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to other adapters until the installation is complete and the host rebooted.

◆ SCSI hard disks are allowed in SAN boot configurations. However, the BIOS for the disk's SCSI adapters must be disabled. Any SCSI disks attached to the host should be disconnected during the operating system installation.

◆ For servers with SCSI CD-ROM drives, ensure that the BIOS is enabled on the SCSI channel that includes the CD-ROM. Disable the BIOS on any other integrated SCSI channels.

◆ For servers with IDE CD-ROM drivers, disable the BIOS on the server's integrated SCSI adapter(s). The SCSI BIOS is not required to boot from the CD-ROM.

◆ Disable the BIOS on any other adapters in the system other than the QLogic adapter designated for booting.

Configuring the QLogic BIOS for SAN boot

After the BIOS is installed and enabled, it must be configured for use for booting from the SAN. The following procedure describes how to configure the BIOS.

1. Connect the Symmetrix Fibre Channel port to the adapter in the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to the other adapters at this time.

2. Boot the server, and press **Ctrl-Q** when the QLogic banner is displayed.

   Note: Different adapter models may display different banners. Be sure to press **Ctrl-Q** for the adapter to be configured.

   The banner display corresponds to the BIOS revision pertinent to the adapters currently installed. Refer to the *EMC Support Matrix* for specific adapters and BIOS revisions.

3. After Fast!UTIL loads, the display depends on whether there are multiple QLogic adapters installed:

   • If there is only one QLogic adapter, the **Fast!UTIL Options** menu appears.

   • If there are multiple QLogic adapters, a list of addresses occupied by those adapters appears. Since the EMC storage array is attached to the lowest-numbered PCI slot, select the first adapter from the list; then press **Enter**. The **Fast!UTIL Options** menu appears.

4. From the **Fast!UTIL Options** menu, select **Configuration Settings** and press **Enter**.

5. From the **Configuration Settings** menu, select **Adapter Settings** and press **Enter**.

6. From the **Host Adapter Settings** menu, select **Host Adapter BIOS** and press **Enter** to enable it if it is not already enabled.

   Note: Refer to Table 3 on page 32 for recommended settings.

7. Press **ESC** to exit the **Configuration Settings** menu.

8. From the **Configuration Settings** menu, select **Selectable Boot Settings** and press **Enter**.

9. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press **Enter** to enable this option if it is not already enabled.

10. Select **Current Boot Node Name** and press **Enter**.

    The adapter will scan for attached storage devices which will be displayed on the screen.

11. Choose the Symmetrix storage array port from which the system will boot. Its entry will be similar to the following:

VENDOR	PRODUCT	REV	NODE NAME	Port
EMC	SYMMETRIX	5566	50060482BFD06C02	0000E

12. A list of LUNs will be displayed in a new window. Select the LUN to be used as the boot device and press **Enter**.

    Note: On Symmetrix storage arrays, the LUN number of the first visible device to that port should be used.

13. Press **ESC** in the **Selectable Boot Settings** menu to return to the **Configuration Settings** menu.

14. Press **ESC** in the **Configuration Settings** menu to return to the **Options** menu.

15. Select **Save Changes** and press **Enter**.

16. Press **ESC** to exit the **Fast!UTIL** menu.

17. Reboot the host.

Configuring a CLARiiON boot device

This section describes how to install an EMC-qualified version of Linux onto an EMC CLARiiON storage array connected to an Intel-based x86 and x86_64 class systems and AMD Opteron-based x86_64 class systems.

Preparing the CLARiiON storage array

◆ It is recommended that Access Logix™ be enabled on the CLARiiON storage array for LUN masking purposes.

◆ Boot device support requires a Navisphere Management station with Navisphere Manager or CLI installed. The station must be separate from the server being installed and must be networked to the CLARiiON.

◆ Before installing Linux onto an EMC CLARiiON Array, the array must have one bound LUN allocated to the Storage Group for the server being installed. The LUN must be owned by the SP connected to the boot adapter.

◆ During the installation procedure, only one LUN should be in the boot Storage Group, so that the boot LUN may be identified easily. After the installation, additional LUNs may be added to the host's Storage Group.

Note: If LUNs need to be created, refer to the Navisphere Management software documentation for the array type.

Preparing the host

◆ Create a zone that includes the WWPN of the adapter to be used and one SP port. Add the newly-created zone to the zone configuration in the fabric and enable the zone configuration.

◆ EMC recommends using port 0 on the SP for consistency.

◆ The PCI Fibre Channel adapter must be the lowest-numbered PCI slot in the server. For example, if there are three adapters in the system in slots 2, 4, and 5, connect the cable to the adapter in slot. Do not connect cables to other adapters until the installation is complete and the host rebooted.

- ◆ SCSI hard disks are allowed in SAN boot configurations. However, the BIOS for the disk's SCSI adapters must be disabled. Any SCSI disks attached to the host should be disconnected during the operating system installation.

- ◆ For servers with SCSI CD-ROM drives, ensure that the BIOS is enabled on the SCSI channel that includes the CD-ROM. Disable the BIOS on any other integrated SCSI channels.

- ◆ For servers with IDE CD-ROM drivers, disable the BIOS on the server's integrated SCSI adapter(s). The SCSI BIOS is not required to boot from the CD-ROM.

- ◆ Disable the BIOS on any other adapters in the system other than the QLogic adapter designated for booting.

Configuring the QLogic BIOS for SAN boot

After the BIOS is installed and enabled, it must be configured for use for booting from the SAN. The following procedure describes how to configure the BIOS.

1. Connect the CLARiiON SP Fibre Channel port to the adapter in the lowest-numbered PCI slot in the server.

2. Boot the server, and press **CTRL-Q** when the QLogic banner is displayed.

   Note: Different adapter models may display different banners. Be sure to press **CTRL-Q** for the adapter to be configured.


   ```
   QLogic Corporation
   QLA2300 PCI Fibre Channel ROM BIOS Version 1.17
   Copyright © Qlogic Corporation 1993-1999 All rights reserved
   Press <CTRL - Q> for Fast!UTIL
   www.qlogic.com
   ```

   The banner display corresponds to the BIOS revision pertinent to the adapters currently installed. Refer to the *EMC Support Matrix* for specific adapters and BIOS revisions.

3. After Fast!UTIL loads, the display depends on whether there are multiple QLogic adapters installed:

   • If there is only one QLogic adapter, the **Fast!UTIL Options** menu appears.

- If there are multiple QLogic adapters, a list of addresses occupied by those adapters appears. Since the EMC storage array is attached to the lowest-numbered PCI slot, select the first adapter from the list; then press **Enter**. The **Fast!UTIL Options** menu appears.

4. From the **Fast!UTIL Options** menu, select **Configuration Settings** and press **Enter**.

5. From the **Configuration Settings** menu, select **Adapter Settings** and press **Enter**.

6. From the **Host Adapter Settings** menu, select **Host Adapter BIOS** and press **Enter** to enable it if it is not already enabled.

   Note: Refer to Table 3 on page 32 for recommended settings.

7. Press **ESC** to exit the **Configuration Settings** menu.

8. From the **Configuration Settings** menu, select **Selectable Boot Settings** and press **Enter**.

9. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press **Enter** to enable this option if it is not already enabled.

10. Select **Current Boot Node Name** and press **Enter**.

    The adapter will scan for attached storage devices which will be displayed on the screen.

    Note: Depending upon the CLARiiON array model, the adapter may not yet detect any LUNs or it may detect a LUNZ labeled device. This behavior is acceptable and to be expected.

11. Skip from the BIOS configuration to a separate host that has Navisphere Management software installed and is attached to the CLARiiON storage array.

    Since the operating system is not yet installed, the Naviagent/CLI is not running on the Linux host. Therefore, the adapter may need to be registered manually.

    From the management host, manually register the host's adapter and add the host to the newly created Storage Group using Navisphere Management software.

12. Return to the BIOS configuration and reboot the host.

13. When the QLogic banner is displayed (as shown in step 2), press **Ctrl-Q**.

14. Once the Fast!UTIL loads, select the **Configuration Settings** menu and press **Enter**.

15. From the **Configuration Settings** menu, select the **Selectable Boot Settings** menu and press **Enter**.

16. From the **Selectable Boot Settings** menu, select **Selectable Boot Device** and press ENTER to enable this option if it is not already enabled.

17. Select **Current Boot Node Name** and press **Enter**.

    The adapter will scan for attached storage devices and a list of the available LUN(s) will be displayed. Select the CLARiiON port WWN from which the host will boot and select the LUN to be used as the boot device and press **Enter**.

    Note: On CLARiiON storage arrays, the desired boot LUN is 000.

18. Press **ESC** in the **Selectable Boot Settings** menu to return to the **Configuration Settings** menu.

19. Press **ESC** in the **Configuration Settings** menu to return to the **Options** menu.

20. Select **Save Changes** and press **Enter**.

21. Press **ESC** to exit the **Fast!UTIL** menu.

22. Reboot the host.

Installing onto the EMC storage array with the QLogic v8.x-series driver

EMC supports specific kernel and driver versions when booting from the SAN. Currently RHEL4, RHEL4 U1, RHEL4 U2, SLES9 SP1, and SLES9 SP2 in the kernel driver do not contain an EMC-qualified version of the QLogic v8.x-series driver. However, the default QLogic driver integrated into both distributions may be used for the operating system installation on an EMC storage array device.

When using the QLogic driver integrated into the distribution, there isn't a requirement to create a driver diskette image.

Using the installation CDs, boot the server to be installed. The installation may be performed as it would when using an internal adapter/controller driver.

Once the installation is complete, use QLogic driver installation script to upgrade the driver to the EMC-qualified driver version as follows:

```
./qlinstall -up
```

Note: Refer to the *EMC Support Matrix* for the most recent information on qualified kernel and driver releases as well as architectures.

Upgrading the kernel

After successfully completing the installation and rebooting the host, the kernel may be upgraded to a newer kernel revision to take advantage of fixes and features incorporated into the newer kernel errata.

Note: Refer to the *EMC Support Matrix* for supported kernel revisions.

EMC recommends installing the kernel packages, rather than upgrading them, so that either kernel version may be used for boot. In addition, if a boot diskette was created during the original installation, an updated copy should be created after the upgrade.

Installing RHEL 5.2 and SLES 10 SP2 operating systems onto a boot device using FCoE Adapters

EMC supports booting from an array device in FCoE environments with RHEL 5.2 and SLES 10 SP2 operating systems.

Because RHEL 5.2 and SLES 10 SP2 distributions do not have in-kernel support for the QLogic FCoE adapters, QLogic provides a special "DD" driver package to allow loading of the FCoE adapter driver at install time, which allows for installing to an array device. These driver packages are available from the EMC-supported section of the QLogic website.

The DD driver package is available as a floppy disk image and a CD image, which can be copied to the respective media, based on the removable storage options in the host platform.

RHEL 5.2 OS SAN-boot installation with QLogic FCoE adapters

To install RHEL 5.2 SAN-boot with QLogic FCoE adapters:

1. Obtain the appropriate "DD" driver kit for the QLogic FCoE adapter from the EMC-supported section of the QLogic website, and copy it to the appropriate media (floppy disk or CD).

2. Insert RHEL 5.2 product CD #1 in the CD drive and boot the system.

   The system boots from the CD and stops at the boot prompt.

3. At the boot prompt, type:

   linux dd

   and then press **ENTER**.

   The Driver Disk message box displays the prompt:

   ```
   Do you have a driver disk
   ```

   Select **YES**, then press **ENTER**.

4. From the **Driver Disk Source** window, select the driver source:

   • If the driver file is on a disk, select fd0, then press **ENTER**.
   • If the driver file is on a CD, select **hd*x*** (where *x*=CD drive letter), then press **ENTER**.

   The **Insert Driver Disk window** displays.

5. Insert the disk (described in Step 1) into either the floppy disk drive or the CD drive, depending on the option selected in Step 4.

6. Click **OK**, then press **ENTER**.

   The SCSI driver is loaded automatically.

7. The **Disk Driver** window displays, prompting for more drivers to install. Click **NO**, then press **ENTER**.

8. Insert the current Linux Red Hat product CD #1 in the CD drive (remove the iso-dd-kit CD first if necessary), then press **ENTER**.

9. Follow the on-screen instructions to complete the installation.

SLES 10 SP2 OS SAN-boot installation with QLogic FCoE adapters

To install SLES 10 SP2 SAN-boot with QLogic FCoE adapters:

1. Obtain the appropriate "DD" driver kit for the QLogic FCoE adapter from the EMC-supported section of the QLogic website, and copy it to the appropriate media (floppy disk or CD).

2. Insert the SLES 10 CD #1 in CD drive and boot the system.

3. On the main installation screen, press **F5**.

4. The system prompts you to select **Yes**, **No**, or **File**.

   Select **Yes**.

5. Select the installation option, then press **ENTER**

   In response to the following prompt:

   ```
   Please choose the driver update medium.
   ```

   c. Make sure the dd-kit is inserted in proper drive (i.e., CD-ROM or Floppy).

   d. Select appropriate drive, then press **ENTER**. This loads the driver update to the system.

6. If the driver update was successful, the following message displays:

   ```
   Driver Update OK.
   ```

   Press **ENTER**.

7. If the system prompts you to update another driver, click **BACK**, then press **ENTER**.

The following message displays:

```
Make sure that CD number 1 is in your drive.
```

8. Put SLES 10 CD 1 in the drive and press **OK**.

9. Follow the on-screen instructions to complete the installation.

8

Additional Notes

This chapter provides additional notes to conside

Ethernet connectivity over the CNA

The QLogic FCoE CNA delivers lossless 10 Gb/s Enhanced Ethernet support with dynamic allocation of networking and storage bandwidth that may be used for either system ethernet or iSCSI traffic, as well as FCoE. The Linux driver that supports the ethernet and iSCSI traffic for this device is ixgbe. The driver will automatically be installed and loaded by your supported Linux distribution.

To configure the network capabilities of your QLogic CNA, refer to your Linux distributor's network administrator's guide for more details. If you are configuring your CNA for iSCSI traffic, refer to the *EMC Linux iSCSI Attach Release Notes* found on http://powerlink.emc.com for the iSCSI configuration after configuring the network first.

Device reconfiguration procedures

There are three methods to reconfigure the devices added or removed in the system.

Method 1:
Reboot the system :

```
shutdown -r now
```

Method 2:
Remove and reinsert the modular driver

For example:

```
modprobe -rv qla2400
modprobe -v qla2400
```

Method 3:
Use QLogic script to dynamically scan the devices. QLogic has the *QLogic FC HBA LUN Scan Utility* which is available from the EMC-approved site on the QLogic website.

Usage examples

◆ To re-scan all the adapters, enter one of the following commands:

 # ./ql-dynamic-tgt-lun-disc.sh

 # ./ql-dynamic-tgt-lun-disc.sh -s

 # ./ql-dynamic-tgt-lun-disc.sh --scan

◆ To re-scan and remove any lost LUNs, enter one of the following commands:

 # ./ql-dynamic-tgt-lun-disc.sh -s -r

 # ./ql-dynamic-tgt-lun-disc.sh --scan --refresh

To invoke the menu, enter one of the following commands:

 # ./ql-dynamic-tgt-lun-disc.sh -i

 # ./ql-dynamic-tgt-lun-disc.sh --interactive

Adapter information for RHEL5 and SLES10

QLogic fully supports upstream driver using sysfs start from RHEL5 and SLES10. QLogic adapter information is not available on /proc file system. To get the QLogic adapter information, you can manually go to /sys file system to probe all the necessary information. QLogic provides a script tool to help. You can download *QLogic FC HBA Information Utility* from EMC-approved site on the QLogic website.

Usage examples

To display default adapter information, enter the following command:

 # ./ql-hba-info.sh

To display detailed information of host 7, enter the following command:

 # ./ql-hba-info.sh 7

To display detailed information of all hosts, enter the following command:

 # ./ql-hba-info.sh --all

To support -v/--verbose parameters, enter the following commands:

 # ./ql-hba-info.sh -v 7

 # ./ql-hba-info.sh --verbose --all

To display QLogic adapters driver command line parameters, enter the following commands:

 # ./ql-hba-info.sh -p

 # ./ql-hba-info.sh --parameters

To display statistics of host 8, enter the following command:

 # ./ql-hba-info.sh -s 8

To display statistics of all host, enter the following command:

 # ./ql-hba-info.sh --statistics --all

SNIA API for third-party software (EMC ControlCenter and Solution Enabler)

For the OS version that supports in kernel driver, SNIA API library shall be installed in the host to display QLogic adapter information for EMC products such as EMC ControlCenter and Solution Enabler usage. For the OS version that supports out of kernel drivers, the installation script will install the API library as well as FC driver. This API library provides Linux Common adapter API Shared Library and it supports Storage Networking Industry Association (SNIA) certified Storage Management Interface Specification (SMI-S) provider for Linux. The API library is available from the EMC-approved site on the QLogic website.

OS upgrade from supporting out of kernel driver to OS version supporting in kernel driver

When RHEL or SLES is upgraded from supporting the OS version that supports the out of kernel driver to the OS version that supports the in kernel driver, old entries in the configure file will not be delete. For Qlogic in kernel driver, the following features are disabled:

- ◆ Persistent binding
- ◆ QLogic failover

QLogic driver parameter ConfigRequired and ql2xfailover do *not* need to be set.

For example:

- ◆ For RHEL, vi `/etc/modprobe.conf`.
- ◆ For SLES, vi`/etc/modprobe.conf.local`.

Delete the following unnecessary driver parameter:

```
options qla2xxx ql2xfailover=0 ConfigRequired=0
remove qla2xxx /sbin/modprobe -r --first-time --ignore-remove qla2xxx && {
/sbin/modprobe -r --ignore-remove qla2xxx_conf; }
```

Then rebuild RAM disk.

Rebooting the host

Rebooting the host allows for reliable detection of newly added devices. The host may be rebooted after all I/O has stopped.

Unloading and reloading the modular QLogic driver

- ◆ Stop all I/O.

- ◆ Unmount all file systems attached to the QLogic driver.

- ◆ If the Naviagent/CLI is installed and enabled on the host, then the Naviagent/CLI service must be stopped.

    To stop the Naviagent/CLI service, issue one of the two following commands:

    /etc/init.d/naviagentcli stop
    or

    service naviagentcli stop

◆ If PowerPath is installed and enabled on the host, then the PowerPath service must be stopped.

To stop the PowerPath service, issue one of the two following commands:

`/etc/init.d/PowerPath stop`

or

`service PowerPath stop`

◆ If the QLogic SANsurfer daemon `qlremote` is installed and enabled on the host, then the `qlremote` service must be stopped in order for the driver to be removed from the currently running kernel.

To stop the qlremote service, issue one of the two following commands:

`/etc/init.d/qlremote stop`

or

`service qlremote stop`

The **modprobe** command is a wrapper or an extension to **insmod** and **rmmod**. The **modprobe** command uses and maintains a set of files that describe all the modules that are available for the current kernel in `/lib/modules`.

The **modprobe** command can be used to load and unload an entire set of modules. (A *set* of modules can be a single module or a stack of dependent modules.) The command automatically loads all of the modules needed in a module stack based on the information in `modules.dep`.

Note: EMC recommends using `modprobe` to load and unload the QLogic modular driver.

The loading of the module is accomplished with either **modprobe** or **insmod**. These commands are used to install loadable kernel modules into a running kernel. The commands will attempt to link a module into the running kernel by resolving the symbols from the kernel exported symbol table.

The unloading of the module can be accomplished with the **modprobe** (with the -r switch) command or the **rmmod** command. These commands are used to unload the loadable modules from the

running kernel if they are not in use and if other modules are not dependent upon them.

The v8.x series driver consists of multiple modules. For example, if the command **lsmod** is invoked on a server with a QLA2340-E-SP adapters installed, the following three modules will be reported:

◆ `qla2xxx_conf` - The QLogic Linux driver configuration module containing information regarding persistent binding.

◆ `qla2xxx` - The low level QLogic Linux adapter driver module.

◆ `qla2300` - The QLogic Linux adapter firmware loader/personality module for that particular adapter model.

The Linux operating system may panic if any of the following three commands are invoked prior to performing the procedure in the "Unloading and reloading the modular QLogic driver" on page 108 to prepare for removing the driver.

◆ `modprobe -r qla2300`

◆ `modprobe -r qla2xxx_conf`

◆ `rmmod qla2300`

Device reconfiguration: Device numbering

In the Linux kernel, the SCSI addresses are not used in the device names as they are in other types of UNIX (Sun, SGI, HP-UX, and BSD, for example). Block device filenames take the form /dev/sd ln, where l is the letter denoting the physical drive and n is the number denoting the partition on that physical drive. Disk device file names and major and minor numbers are assigned dynamically at boot time or device loading time in the order of discovery.

Depending upon the hardware configuration, if a device is added and the system rebooted, the device numbering might change, possibly rendering the host's mount table inaccurate. For the most consistent results and to reduce the possibility of mount table inaccuracies, new devices should be appended (if possible) to the list of already attached devices. For example, if the host contains multiple adapters, it would be best to append the new device to the last adapter and to the end of the device list attached to that adapter. This would eliminate the need to alter the preexisting entries in the mount table, since the new device could be appended to that as well.

If a new device were added to the first out of two adapters and the system rebooted, the devices all shift by one number and the mount table entries would also need to be shifted by one device. If there is only one adapter, the new device can more easily be appended to the list of the regularly attached devices and the mount table altered accordingly.

HPQ server-specific note

When using HPQ systems, it is highly recommended that the HPQ SmartStart CD be run to configure the HPQ server prior to installing the Linux operating system. The SmartStart CD is shipped by HPQ with their systems and is a bootable CD that is used to configure HPQ servers. If another operating system is selected other than Linux, there may be problems installing the operating system or using the drivers installed in the kernel.

Follow these steps to select Linux as the primary operating system from the HPQ SmartStart CD:

1. Boot the HPQ server using the SmartStart CD.

2. Select the **System Configuration Utility**.

3. After the System Configuration Utility has started, a dialog titled **Steps in Configuring Your Computer** appears, with the following options listed:

   Step 1: Important System Configuration Information
   Step 2: Add or Remove Boards
   Step 3: View or Edit Details
   Step 4: Examine Switches or Print Report
   Step 5: Save and Exit

   Select **Step 3: View or Edit Details**.

4. In the new window, select **Primary Operating System** (the first item in the list); then select **Unix** from the list of possibilities.

5. Another list of UNIXes appears; select **Linux** from this list.

6. Select **Enter**; then select <F10> **Done**.

7. The console returns to the **Steps in Configuring Your Computer** dialog. Select **Step 5: Save and Exit**.

   When prompted, select **Save the configuration and restart the computer**.

8. When prompted again to save your configuration and reboot, press **Enter** to reboot the system.

9. You may then proceed with installing your operating system.

(CLARiiON Only) disconnected ghost LUNs

When a Linux host is attached to both SPs in a CLARiiON storage array, the driver will report a disconnected LUN 0 on SPB and a failure to read the capacity of the device. The Navisphere® Host Agent requires that disconnected LUN 0 be reported properly. A device file name is allocated to the disconnected LUN 0 in the /dev filesystem, but the device cannot be mounted, partitioned, or otherwise accessed.

Here is an example of a disconnected LUN 0 being reported:

```
Jul 17 14:35:57 l82bi134 kernel: sdb : READ CAPACITY failed.
Jul 17 14:35:57 l82bi134 kernel: sdb : status = 1, message = 00, host = 0,
driver = 28
Jul 17 14:35:57 l82bi134 kernel: Current sd00:00: sense key Illegal Request
Jul 17 14:35:57 l82bi134 kernel: Additional sense indicates Logical unit not re
dy,cause not reportable
Jul 17 14:35:57 l82bi134 kernel: sdb : block size assumed to be 512 bytes, disk
size 1GB.
Jul 17 14:35:57 l82bi134 kernel: sdb: I/O error: dev 08:10, sector 0
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 2
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 4
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 6
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 0
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 2
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 4
Jul 17 14:35:58 l82bi134 kernel: I/O error: dev 08:10, sector 6
Jul 17 14:35:58 l82bi134 kernel: unable to read partition table
```

A

Setting Up External Boot for IBM Blade Server HS40 (8839)

This appendix contains information on setting up external boot for IBM Blade Server HS40.

Configure HS40 BladeCenter server to boot from external array

IBM HS40 (8839) Blade Servers encounter a dual-port adapter conflict when attempting to configure boot BIOS to boot from an external array. To configure an HS40 BladeCenter server to boot successfully follow the steps below.

1. Create a single zone containing the adapter port from which you want to boot. This prevents any conflicts with the other fibre port.

2. Configure the QLogic BIOS to boot from the EMC array as described in Chapter 7, "Configuring a Boot Device on an EMC Storage Array."

   During server POST, be sure that the QLogic banner displays the selected boot LUN correctly before continuing.

3. Reboot the host and press **F1** to enter the server **BIOS Configuration/Setup Utility**.

4. Select **Devices and I/O Ports**, and press **Enter**.

5. Select **IDE Configuration Menu,** and press **Enter**.

6. Select the **Onboard PCI IDE Controller,** and press **Enter**. Under the options menu, set this IDE Controller to disabled. This will disable the internal IDE disk drives.

7. Press **ESC** twice to return to the **IDE Configuration Menu** and then select **Start Options,** and press **Enter**.

8. Select **Startup Sequence Options,** and press **Enter**.

9. Select **Third Startup Device,** and press **Enter**.

10. Select **HAx PortID xxxxxx xxxxx,** and press **Enter**. This boot device will be replaced as the **Third Startup Device** in the **Startup Sequence Options**.

11. Press **ESC** until you are prompted to save your changes. Then exit the **BIOS Configuration/Setup Utility**.

From this point, you may install the Linux operating system to the external boot disk using the normal Fibre Channel installation procedures described earlier in this document.

B

Special Instructions

This appendix contains special instructions for the following:

CLARiiON CX200 direct-connect dual-host Oracle9i RAC or RHEL 2.1 Cluster Manager cluster configurations with QLA234x adapters

For CLARiiON CX200 direct-connect dual-host Oracle*9i* RAC or RHEL 2.1 Cluster Manager cluster configurations with QLA234x adapters, the default adapter optic jumper position must be changed.

⚠ **CAUTION**

Modifying the jumper setting without using the recommended firmware and/or drivers may cause a loss of connectivity.

1. Remove the adapter from the server as instructed by the server guide.

2. Locate jumper(s) J3 (QLA2340) or J3 and J4 (QLA2342).

3. Move the jumper(s), onto pins 1–2 (if not already there).

To return the jumper(s) to the default factory position, move the jumper(s) back to pins 2–3.

Setting the FC-AL loop ID for CLARiiON CX200 direct-connect Oracle9iRAC and RHEL 2.1 Cluster Manager configurations with QLogic QLA234x-Series adapters

The FC-AL Loop ID for QLA234x-series adapters must be set manually when directly attaching RHEL 2.1 hosts in Oracle9iRAC or RHEL 2.1 Cluster Manager configurations.

Follow the steps below to enable hard addressing and to set the loop ID on each adapter. Perform this procedure on both nodes in the cluster connected to the CX200.

The topology must also be changed from the default **Point-to-Point** to **Loop Only**. Refer to "Manually setting the topology for QLogic adapters" on page 34 for instructions.

1. Boot the Linux host.

2. Press **CTRL-Q** when prompted to **Press CTRL-Q for Fast!UTIL**. This prompt appears with the QLogic startup banner.

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